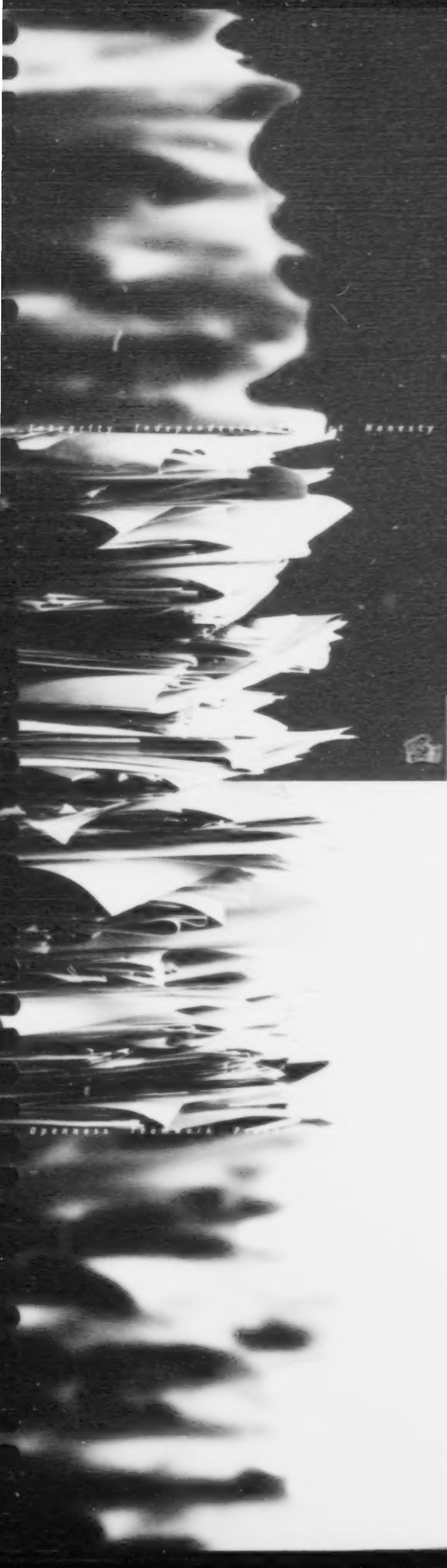
Integrity Independence Honesty Balanced Perspectives
Openness Teamwork

Manitoba
November 2005

OFFICE OF THE
AUDITOR GENERAL

Environmental Audits

Review of the Province of Manitoba's Management of Contaminated Sites

The Protection of Well Water Quality in Manitoba

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Office of the Auditor General
500 - 330 Portage Avenue
Winnipeg, Manitoba R3C 0C4

November 2005

The Honourable George Hickes
Speaker of the House
Room 244, Legislative Building
Winnipeg, Manitoba
R3C 0V8

Dear Sir:

I have the honour to transmit herewith my report titled, *Environmental Audits,* to be laid before Members of the Legislative Assembly in accordance with the provisions of Section 28 of The Auditor General Act.

Respectfully submitted,

Jon W. Singleton, CA•CISA
Auditor General

106-00962/

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REVIEW OF THE PROVINCE OF MANITOBA'S MANAGEMENT OF CONTAMINATED SITES

The management of our natural resources has improved considerably in the last century through increased knowledge and awareness of our environment. To assist in these efforts, Governments have enacted legislation to preserve the quality of the environment by requiring remediation of contaminated lands.

Our review of the Province of Manitoba's (Province) management of contaminated sites indicated that there is much room for improvement in the establishment of policy and practices in how the Province manages and reports on potential contaminated sites, such as sites owned by departments and special operating agencies, orphaned and abandoned (O&A) mines, and O&A fuel storage sites.

In the course of our review, we found that the Province has not developed adequate processes to identify and remediate its own contaminated sites. We also found that legislation is not clear regarding the Province's responsibility and liability for O&A mine sites and O&A fuel storage sites. Those sites that may have been abandoned have left the Province with a moral responsibility for assessment and remediation with costs potentially exceeding $75 million.

I am encouraged by the cooperation we received from the Department of Conservation, the Department of Industry, Economic Development and Mines, and the Department of Finance during our review and by their acceptance of our recommendations with a commitment to address them in a timely manner. I am hopeful that during the next year, the Province will take steps to ensure a more thorough identification of sites, and the related estimated potential financial liabilities.

Jon W. Singleton, CA•CISA

1.0 Executive Summary

The Department of Conservation (Conservation) has a "mandate for preserving the quality of our environment for future generations". As such, it has a responsibility for ensuring the cleanup (remediation) of contaminated sites is carried out effectively and in accordance with applicable guidelines and regulations.

In managing contaminated sites, there is also a potential for significant liabilities for the Province of Manitoba (Province) that should be recorded and/or disclosed in its financial reporting (the Public Accounts). Further, and more significantly, a delay in remediation may have consequences to the environment.

Our review was initiated in response to evolving changes to government financial reporting standards. By March 31, 2006, the Province and all senior governments in Canada will be required under Public Sector Accounting Board (PSAB) of the Canadian Institute of Chartered Accountants (CICA) to accrue and/or disclose its environmental liabilities in accordance with recent standards for accounting for liabilities and contingent liabilities. Therefore, we reviewed the processes in place for the Province to be able to accurately identify, and where required, estimate the cost of environmental remediation for provincially owned, contaminated sites under their responsibility (i.e., owned by provincial departments and Special Operating Agencies [SOAs]). In the course of our work we determined that a significant liability may exist for the Province relating to orphaned and abandoned (O&A) mines and O&A fuel storage sites where contamination exists.

Overall:

- The Province does not have adequate processes in place to ensure that provincially owned contaminated sites are identified and inventoried in a timely and complete manner.
- The responsibility/liability for O&A mines and O&A fuel storage sites is not clearly defined. The Province is not legally responsible for remediation. However, officials recognize that in the absence of a responsible party, the Province will, in all likelihood, be responsible for remediation.
- Preliminary, incomplete estimates of environmental liabilities for provincially owned contaminated sites, O&A mines and O&A fuel storage sites total approximately $75 million. As sites are further identified and inspection and assessment work is conducted, the estimate of liability may increase. The $75 million current estimate is composed of:
  - Provincial Department and SOA owned sites – dollar amount unknown;
  - O&A Mine Sites - $61.5 million; and
  - O&A Fuel Storage Sites - $13.75 million.

Our examination did not include the management of contaminated sites by crown organizations, government business enterprises, schools, universities, colleges, hospitals and municipalities.

CONCLUSIONS

The following are some specific conclusions of this review:

- The Province does not have adequate processes in place to ensure provincially owned contaminated sites are identified and inventoried in a timely and complete manner. There is a risk that undetected provincial department and SOA owned contaminated sites exist (**Section 4.1**).
- Conservation has not quantified the estimated cost that will be required to remediate provincially owned sites in the future (**Section 4.1**).
- The processes for identifying potential O&A fuel storage sites was not adequate to ensure timely and complete knowledge of those sites. It is possible that undetected sites exist. Responsibility for those sites is not clearly defined (**Section 4.2**).
- The Province's prioritization processes for O&A fuel storage sites were not adequate to ensure resources were directed to the remediation measures that would benefit the environment the most (**Section 4.2**).
- The Mines Branch (Mines) of Industry, Economic Development and Mines does not have a proactive process to identify, inspect, and assess O&A mine sites. It is possible that undetected sites exist. Responsibility for those sites is not clearly defined and the potential liability of the Province is not adequately identified (**Section 4.3**).
- The Province met the standards for reporting environmental liabilities that were in effect for the 2003/04 and 2004/05 Public Accounts, but is not fully positioned to quantify the environmental liabilities that will need to be either recorded or disclosed in the 2005/06 Public Accounts in accordance with new PSAB standards (**Section 4.4**).
- The Province does not have a documented plan and process for quantifying its environmental liability in the Public Accounts for department owned and SOA contaminated sites, and O&A fuel storage and mine sites for the year ending March 31, 2006 (**Section 4.4**).

Related recommendations are contained in **Section 5.0**.

2.0 Introduction

2.1 OBJECTIVES

We identified several objectives regarding whether the Province of Manitoba (Province) has an adequate program for managing its contaminated sites and adequately reporting the potential liability in the Public Accounts:

- To determine whether adequate processes were in place to ensure that the Province was in compliance with key sections of the Contaminated Sites Remediation Act (CSRA), the Dangerous Goods Handling and Transportation Act (DGHTA), and the Storage and Handling of Petroleum Products and Allied Products Regulation (Petroleum Products Regulation). In particular whether:
  - Processes for identifying provincially owned contaminated sites were adequate to ensure timely knowledge of those sites;
  - A database of provincially owned contaminated sites was complete and updated in a timely manner; and
  - Criteria for designating a site as contaminated, under the CSRA Act, were consistent with those set by other jurisdictions in Canada.
- To determine whether the Province's prioritization processes were adequate to ensure available financial resources were directed to remediation measures that collectively benefited the environment the most;
- To determine whether reporting for environmental liabilities as a result of provincial ownership or responsibility for sites was/is in compliance with recent PSAB liability and contingent liability recognition standards; and
- To determine whether processes for estimating the costs associated with contaminated sites were adequate to ensure reasonable estimates of the Province's liability for appropriate reflection in the Public Accounts.

2.2 INITIATION

Our review focused on the Province's processes in place to ensure that the Province itself, and specifically the Department of Conservation (Conservation), as the department responsible for the Contaminated Sites Remediation Act (CSRA) and other related Acts, was in compliance with these Acts.

Our review was initiated in response to evolving changes to government financial reporting standards. By March 31, 2006 the Province of Manitoba and all senior governments in Canada, will be required under the Public Sector Accounting Board (PSAB) of the Canadian Institute of Chartered Accountants (CICA) to accrue and disclose its environmental liabilities. Therefore, we reviewed the processes in place for the Province to be able to accurately identify and, where required, estimate the cost of environmental remediation for which it was responsible.

2.3 AUDIT AUTHORITY

The audit was carried out under the authority of the following sections of The Auditor General Act:

Section 9(1)

> *"The Auditor General is the auditor of the accounts of the government, including those relating to the Consolidated Fund, and must make any examinations and inquiries that he or she considers necessary to enable the Auditor General to report as required by this Act."*

Section 14(1)

> *"In carrying out his or her responsibilities under this Act, the Auditor General may examine and audit the operations of a government organization with regards to any of the following matters:*
>
> *a) Whether financial and administrative provisions of the Acts, regulations, policies and directives have been complied with;*
>
> *b) Whether public money has been expended with proper regard for economy and efficiency;*
>
> *c) Whether the Assembly has been provided with appropriate accountability information;*
>
> *d) Whether the form and content of financial information documents is adequate and suitable."*

2.4 ORIGINAL SCOPE

The original scope of our review was limited to sites that were directly owned by the Province through the operations of provincial departments and Special Operating Agencies (SOAs).

Our review was conducted between May 2004 and May 2005 and included such interviews and procedures that we determined were necessary to address our objectives.

We interviewed those individuals, within Conservation and Industry Economic Development and Mines (IEDM), responsible for the management and administration of the CSRA and associated Acts and Regulations. We also interviewed officials within Conservation, IEDM and the Department of Finance (Finance) who have responsibility for provincial financial reporting of environmental liabilities.

In addition, we reviewed the specific Acts, documents, and records within the departments as well as the Environmental Management System (EMS) maintained by Conservation.

2.5 EXPANSION OF SCOPE

In the course of our initial work we determined that a significant liability may exist for the Province relating to O&A sites where contamination exists, specifically relating to O&A fuel storage sites and O&A mine sites.

As a result, we expanded the scope of our review to assess how the Province is managing this issue. We assessed the process by which the Province ensures that these sites are identified, and that the potential liability to the Province related to these sites can be estimated. We also assessed how the Province intends to estimate the potential financial liability for inclusion in the Public Accounts of Manitoba, in accordance with the financial reporting requirements for governments.

For the purposes of our review, O&A sites refer to sites which were at one time under the private ownership of an individual or legal entity other than the Province. These sites fall into two main categories - O&A fuel storage sites (provincial estimate: 250 sites) and O&A mine sites (provincial estimate: 150 sites).

2.6 SCOPE EXCLUSION

Our review did not include public sector entities such as crown organizations, government business enterprises, schools, universities, colleges, hospitals, and municipalities. These public sector entities are responsible for their own operations, including management of environmental issues. They are responsible for reporting their environmental liability in conformance with current accounting standards.

Our intent is to examine management of contaminated sites of these entities in a subsequent review.

3.0 Background

3.1 ENVIRONMENTAL RESPONSIBILITY

As noted in Conservation's *Guideline for Designation of Contaminated Sites in Manitoba* (**Appendix D**):

> *"Historical practices, most of them environmentally unacceptable today, have created current conditions that could potentially harm human health and the environment. These activities include the improper use, handling, storage and disposal of substances containing chemicals with the potential to cause toxicity. In many cases, release of these chemicals into the environment has resulted in "unsafe" exposures to humans and the environment.*
>
> *Manitoba's Contaminated Sites Remediation Act (CSRA) defines a site as contaminated if, "having regard to any current, permitted or foreseeable use of a site, that the site is contaminated at a level which poses or may pose a threat to human health or safety or to the environment". However, throughout North America, many sites with contamination that would not pose a threat to human health, safety, or to the environment have been remediated for economic reasons and land transaction purposes. Although remediation for these reasons is not discouraged by Manitoba Conservation, emphasis should be placed on sites that pose risks to human health and the environment. The CSRA embodies the risk-based principle to designate contaminated sites in Manitoba. The CSRA*

> *has been developed to outline the evaluative process that applies risk-based protocol to designate contaminated sites in Manitoba."*

3.2 FINANCIAL RESPONSIBILITY

In managing contaminated sites, there is also a requirement for the estimated financial responsibility of the Province to be recorded and/or disclosed as a liability in the audited financial statements of the Public Accounts of Manitoba.

3.3 ORGANIZATIONAL RESPONSIBILITY

The Province is legally the owner of all "Crown Land" (land which is not otherwise legally owned or leased by another individual or legal entity) in Manitoba. Provincial departments and SOAs have operations located on crown lands or utilize crown lands. The Province and its agents are responsible to ensure that they are in compliance with the CSRA and other applicable Acts and Regulations to ensure the protection of the environment in those cases where the operations of the Province may have an impact on the environment.

Conservation has the mandate for preserving the quality of the environment and is responsible for the administration and enforcement of the CSRA. Conservation has been assigned responsibility for O&A fuel storage sites.

IEDM has assumed responsibility for O&A mine sites. These sites are specifically exempted under the CSRA.

Finance is responsible for ensuring that the Province's financial reporting, including the disclosure of environmental liabilities, is in conformance with the reporting standards for the Public Accounts.

3.4 APPLICABLE LEGISLATION AND REGULATIONS

In our review we looked at the key sections of the following acts and related regulations as they apply to the management of contaminated sites:

- Contaminated Sites Remediation Act (CSRA);
- Dangerous Goods Handling and Transportation Act (DGHTA); and related
- Storage and Handling of Petroleum Products and Allied Products Regulation (Petroleum Products Regulation).

The key act is the CSRA. The CSRA, Part 1 - Purpose, Interpretation, Application, states:

> *"The principal purpose of this Act is to provide for the remediation of contaminated sites, in accordance with the principles of sustainable development, in order to reduce or mitigate the risks of further damage to human health or the environment and, where practicable, to restore such sites to useful purposes, and to this end to provide*
>
> *(a) a system for identifying and registering contaminated sites in Manitoba;*

(b) a system for determining appropriate remedial measures, if any, to be undertaken in relation to specific contaminated sites and identifying the persons responsible for implementing or contributing to the implementation of those measures; and

(c) a fair and efficient process for apportioning responsibility for the remediation of contaminated sites that

  (i) applies the "polluter pays principle" as set out in clause 21(a) and takes into account various other factors set out in this Act, including factors that would not be relevant in determining civil liability for damages occasioned by contamination,

  (ii) encourages the persons responsible for the remediation to negotiate the apportionment of responsibility among themselves, and

  (iii) combines in a specialist tribunal the knowledge and skill of persons experienced in environmental contamination and remediation and brings them to bear on the review of remediation plans and the resolution of disputes relating to participation in and responsibility for remediation."

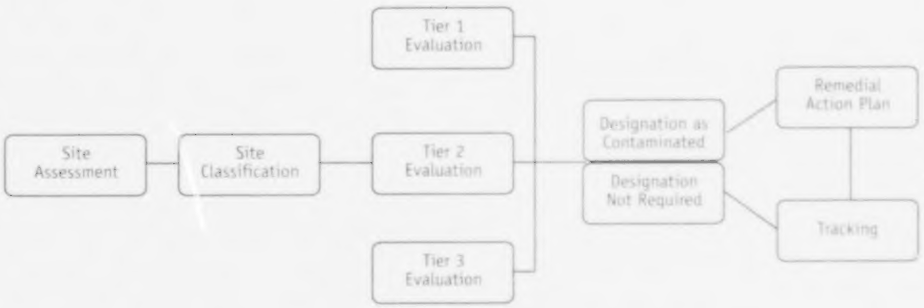
3.5 ASSESSMENT OF CONTAMINATED SITES

There is a basic process followed by the Province to identify and designate contaminated sites, and to evaluate the level of risk. This process includes conducting site assessments, characterizing the contaminant and site conditions, and developing an effective remedial plan.

Documentation of this process is illustrated in **Figure 1** and Guideline 98-01, The Environmental Site Investigation in Manitoba - May 2002 (**Appendix C**), and Guideline 97-01, for the Designation of Contaminated Sites in Manitoba - March 1997 (**Appendix D**).

FIGURE 1

Guideline for the Designation of Contaminated Sites in Manitoba



The process of identifying and assessing sites is also documented in a manual that Conservation has been developing. The majority of operating procedures are documented on the government wide intranet.

The CSRA and the DGHTA govern the management of impacted or designated sites. There is also a public registry to record impacted or designated sites. These acts and the related regulations are accessible by the public on the Conservation website http://www.gov.mb.ca/conservation/regoperations/contams/index.html (see **Appendix B**).

Although we refer to sites as contaminated sites throughout this report, it should be noted that we are including in that reference two main types of sites with different associated risks:

- *Designated contaminated site:* a site, designated under the CSRA, where contaminants are present at a level which poses or may pose a threat to human health or safety or the environment.
- *Impacted site:* a site where contaminants are present in concentrations above background levels, but which does not pose a threat to human health or safety or the environment.

3.6 DEFINITION AND IDENTIFICATION OF ORPHANED AND ABANDONED (O&A) SITES

O&A sites refer to sites where the last registered owner of the site either cannot be located, or is unable (for example, in the case of insolvency) to accept responsibility for remediation of the site in compliance with the CSRA.

Under the CSRA the principal of "polluter pays" applies to ensure, where possible, that the party responsible for the contamination of a site bears the cost of site remediation. In cases where the responsible party cannot be located, or has no financial resources to be able to remediate the site, it becomes an O&A site.

The Province has no legal ownership of O&A sites and may not be legally responsible for the remediation of these sites. However, the Province is the steward of the environment. Therefore where those responsible cannot, or will not, accept liability for their actions, and the Province has carried out all legal means to have the responsible party remediate the site, the Province will be obligated to assume ultimate responsibility for remediation of these sites.

3.7 GOVERNMENT REPORTING REQUIREMENTS

Reporting for environmental liabilities as a result of provincial ownership or responsibility for sites should be in compliance with the applicable accounting standards.

The Province, beginning in 2003/04, has disclosed the following note in the audited financial statements for the Public Accounts of Manitoba:

> *"There are currently no accounting standards for environmental liabilities recommended for senior government by the CICA, other than those that*

> *apply to corporate entities related to environmental damage they have created. Because of its role, Government will in all probability assume costs where those responsible cannot or will not accept liability for their actions. The Province is in the process of cataloging suspected contaminated mine and petroleum sites. The catalogue will include a determination of the liable party, an assessment of the nature and level of contamination, the need for clean-up versus containment and a quantification of the estimated cost for clean-up. Once standards are established by the CICA for senior Governments for the recognition and disclosure of these liabilities, their application in the Manitoba setting will be reviewed to determine the appropriate accounting treatment. In addition, the Manitoba Hydro-Electric Board will incur future costs associated with the assessment and remediation of contaminated lands and for the phase-out and destruction of Polychlorinated biphenyl contaminated mineral oil from electrical equipment."*

This disclosure was updated in 2004/05 to the following note in the audited financial statements for the Public Accounts of Manitoba:

> *"The Public Sector Accounting Board of the Canadian Institute of Chartered Accountants introduced changes to public sector accounting standards, effective for the 2006 fiscal year, regarding the recognition and measurement of liabilities and contingent liabilities, including environmental liabilities. Because of its role, Government will, in all probability, assume costs [for environmental liabilities] where those responsible cannot or will not accept liability for their actions. The Province is in the process of cataloguing suspected contaminated mine and petroleum sites. This catalogue will include a determination of the liable party, an assessment of the nature and level of contamination, the need for clean-up versus containment, and a quantification of the estimated cost for clean-up. This process will be completed over the 2006 fiscal year and the Government will determine the appropriate accounting treatment for the recognition of any resulting liabilities. In addition, the Manitoba Hydro-Electric Board will incur future costs associated with the assessment and remediation of contaminated lands and for the phase-out and destruction of polychlorinated biphenyl contaminated mineral oil from electrical equipment".*

Under the current accounting standards in Canada issued September 2004 by the Canadian Institute of Chartered Accountants (CICA), the following Public Sector Accounting Board (PSAB) sections will apply with respect to the recording of environmental liabilities for the fiscal year ending March 31, 2006:

"PSAB Handbook, Section 3200 – Liabilities

.03 Liabilities should be recognized in the financial statements when:

- *a) there is an appropriate basis of measurement; and*
- *b) a reasonable estimate can be made of the amount involved.*

.05 Liabilities are present obligations of a government to others arising from past transactions or events, the settlement of which is expected to result

in the future sacrifice of economic benefits. Liabilities have three essential characteristics:

a) they embody a duty or responsibility to others, leaving a government little or no discretion to avoid settlement of the obligation;

b) the duty or responsibility to others entails settlement by future transfer or use of assets, provision of goods or services, or other form of economic settlement at a specified or determinable date, on occurrence of a specified event, or on demand; and

c) the transactions or events obligating the government have already occurred.

PSAB Handbook, Section 3300 – Contingent Liabilities

.15 A contingent liability should be recognized in the financial statements when:

a) it is likely that a future event will confirm that a liability has been incurred at the date of the financial statements; and

b) the amount can be reasonably estimated."

The above sections of the *PSAB Handbook* are required to be implemented for fiscal years beginning on or after September 1, 2004. The Province will therefore be required to meet these reporting standards for the 2005/06 Public Accounts, covering the fiscal year beginning April 1, 2005 and ending March 31, 2006.

As a result, the Province will be required to provide for any environmental liabilities for which it is responsible and for which the liability amount can be reasonably estimated.

4.0 Observations and Conclusions

In the process of our review we found that there are three types of contaminated sites that are the responsibility of the Province. Our observations are discussed in the following sections:

4.1 Contaminated Sites - Department and SOA owned sites;

4.2 Orphaned and Abandoned Fuel Storage Sites;

4.3 Orphaned and Abandoned Mine Sites; and

4.4 Government Liability for Public Accounts Reporting.

4.1 CONTAMINATED SITES - DEPARTMENT AND SOA OWNED SITES

In the process of our review we had the following objectives and reached the following conclusions.

Objectives	Conclusions
To determine whether adequate processes were in place to ensure that the Province was in compliance with key sections of the Contaminated Sites Remediation Act (CSRA), the Dangerous Goods Handling and Transportation Act (DGHTA), and the Storage and Handling of Petroleum Products and Allied Products Regulation (Petroleum Products Regulation). In particular whether: • Processes for identifying provincially owned contaminated sites were adequate to ensure timely knowledge of those sites; • A database of provincially owned contaminated sites was complete and updated in a timely manner; and • Criteria for designating a site as contaminated, under the Act, were consistent with those set by other jurisdictions in Canada.	An effective contaminated sites management program relies on adequate processes to ensure that accurate, complete and current information is being collected, analyzed and used for decision making. The Province does not have adequate processes in place to ensure that provincially owned contaminated sites are identified and inventoried in a timely and complete manner. There is a risk that undetected provincial department and SOA owned contaminated sites exist. The risk is increased by the partial reliance on third parties for the reporting of contaminated sites, where there is no consequence for non-reporting of site contamination. As a result, the Province cannot ensure that it is in compliance with key sections of the CSRA. Criteria consistent with other jurisdictions have been used where sites have been identified and designated as contaminated under the CSRA.
To determine whether the province's prioritization processes were adequate to ensure available financial resources were directed to remediation measures that collectively benefited the environment the most.	Conservation uses an adequate prioritization process that involves using criteria comparable and consistent with accepted national standards in order to set priorities for remediation and to target remediation resources to those areas with the greatest risk of human health and environmental impact. For those impacted or contaminated sites identified by Conservation, there are eight sites where the Province does not have a quantification of the estimated cost that will be required to remediate those sites.

In reaching these overall conclusions, we specifically reviewed:

- Whether an adequate and timely process exists for identifying contaminated sites;
- How Conservation identifies and inventories provincially and SOA owned sites;
- How compliance with legislation is ensured by Conservation in relation to the:
    - CSRA,
    - DGHTA, and
    - Petroleum Products Regulation;
- Whether criteria for designating sites as contaminated are comparable across jurisdictions in Canada;
- What criteria and process are established to identify the risk in terms of environmental, health or safety risk and whether they are consistent with the Acts;

- How remediation measures are quantified in terms of cost;
- How remediation measures are prioritized –whether by environmental risk or cost to remediate or both; and
- How risk measures are evaluated.

4.1.1 The Process For Identifying Sites Impacted By Contamination Is Dependent On Third Party Reporting And Identification By Environmental Officers

Observations

- Conservation is responsible for the administration of the CSRA. All sites that have had a reported incident of contamination in the Province are recorded in a database maintained by Conservation.
- Conservation relies on incident information received from third parties (e.g., other departments, citizens, corporations, other public sector entities) for the identification and reporting of potentially contaminated sites.
- These parties may be reporting in compliance with various laws and regulations (e.g., reporting fuel spills in compliance with the DGHTA), or as a result of commercial land transactions where as part of a due diligence process the potential or suspected contamination of a site is reported to Conservation (e.g., as required by banks for loans as collateral).
- Conservation also depends on their Environmental Officers, assigned to a region, to detect potentially contaminated sites. Environmental Officers are expected to have good knowledge of their region including potentially contaminated sites. They are also expected to follow up any environmental concerns.
- Conservation recognizes that the process of receiving notice of potentially impacted sites is dependent upon third party identification, except for the work that may be conducted by Environmental Officers.
- The timeliness of incident reporting is dependant on the reporting party. Conservation management stated that their response to a report received is based on the seriousness of a situation. Conservation maintains an emergency environmental response team to deal with major issues as they arise.
- Conservation performs risk assessments based on the information in the incident reports and works with the departments involved to identify the clean-up that may be necessary on all department and SOA sites where notification is received. Petroleum and Emergency Response teams also provide information to Conservation on action required. Any further site assessments would be contracted to environmental consultants.

4.1.2 There Is No Separate Process To Identify And Track Provincial Department And SOA Owned Sites

Observations

Identification Process

- There is a process in place for the reporting or identification of all contaminated sites in Manitoba. However, sites which are owned by provincial departments or SOAs are not separately identified as such on the overall listing.
- Conservation does not have a specific program in place to inform provincial departments and SOAs on how to identify and report back to Conservation existing contaminated sites or an incident of contamination occurring on provincial sites.

Database Management

- Conservation, Operations Headquarters Branch – Environmental Programs Division (Division) maintains a database for all sites identified as "impacted" by contamination referred to as the "Environmental Management System" (EMS). This database inventories sites in Manitoba where an Environmental Incident Report was filed. The database does not separately track or identify sites which are owned by government departments, SOAs, or other government entities.
- An Environmental Officer in the Division is responsible for maintaining the database. District staff (Environmental Officers) input information to the database for their districts. The listing of sites is available to the public through Manitoba Conservation's web site.
- As of March 31, 2005 there were 2,170 tracked sites recorded on the database which include private, commercial and government owned sites. Of these, 7 have been "designated" as contaminated sites. Conservation staff have to manually run through all records to identify the government and SOA owned sites based on the registration recorded for the site.
- Of the 7 sites designated as contaminated in the database the only one that has provincial ownership is a Crown corporation owned site. This site was outside of the scope of our current review.
- We identified 25 sites related to land owned by provincial departments and SOAs. These sites were the responsibility of the following departments:

Transportation and Government Services	12
Conservation	6
Family Services and Housing	5
Health	1
Justice	1
Total	25

4.1.3 Inadequate Process To Ensure Provincial Department And SOA Compliance With The CSRA – Adequate Process To Ensure Compliance With The DGHTA And The Petroleum Products Regulation

Observations

CSRA

- Each department (including Conservation) and each SOA is responsible for ensuring compliance with any law or regulation that applies in the course of its operations, including remediation of contaminated sites.
- Conservation has no specific process in place for government departments and SOAs, to ensure their compliance with the CSRA. There are no educational programs or formal reporting processes for the identification and remediation of contaminated sites.
- For example, if a provincial department established a temporary work site on provincial land, such as an asphalt plant, or a construction site, and contaminated the site, there is no formal reporting process to Conservation.
- Conservation commented that they are aware of difficulties in ensuring their timely awareness of incidents of site contamination. There is no formal reporting system for provincial departments or SOAs requiring submission of a report to Conservation when they become aware of contamination. As a result there may be potentially contaminated sites of which Conservation is not aware.
- Some provincial departments have employees assigned the function of monitoring environmental responsibility such as the Departments of Transportation and Government Services, Agriculture, Food and Rural Initiatives, and Conservation which have designated employees in charge of environmental compliance.
- Provincial departments, where there is a designated employee, may liaise with Conservation; however they have no formal communication or reporting relationship.

DGHTA and Petroleum Products Regulation

- The Province has processes in place for the identification of fuel storage installations and the handling of spills to assist in ensuring compliance with the DGHTA and Petroleum Products Regulation. For example, because of licensing requirements, fuel truck drivers must be certified to handle designated products and adhere to requirements of the legislation. As well, fuel storage installations must have a permit which sets out requirements that must be met before they can receive fuel. Provincial departments and SOAs must meet these requirements.

4.1.4 Criteria For Designating Sites As Contaminated Are Comparable Across Jurisdictions In Canada

Observations

- When information is received by Conservation that a site has potentially been impacted by contamination, a site investigation is conducted.
- The criteria for the identification of an "impacted" site or to "designate" the site as contaminated used by Conservation are based on the Canadian Council of Ministers of the Environment (CCME) guidelines. Those guidelines have been accepted by all Canadian jurisdictions as the national standard. The same criteria are applied to provincial owned sites as any other site (see **Appendix E**).
- The use of CCME criteria means that a similar site would be assessed in a similar way between jurisdictions. A site will be recorded (added to the database) if there is a concern to be tracked. The specific tracking activities are noted on the database.

4.1.5 Standard Criteria And Processes Are Used To Classify Risk

Observations

- The criteria used in assessing impacted sites are those contained in the *Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guidelines* (see **Appendix E**). Conservation has also developed operational guidelines accessible on the provincial intranet which is available to all provincial departments.
- The *CCME Environmental Quality Guidelines* are the Canadian standards that have been adopted by most jurisdictions in Canada, including Manitoba.
- For a site to be "designated" as a contaminated site, there must be a pathway for the contaminant to come into contact with humans which could have an adverse effect on human health. The model is:

  Contamination > Pathway > Receptor

  Where contamination could be caused by a spill of toxic material or discarded materials, the pathway could be by ingestion, physical contact or inhalation and the receptor could be people, plants, or animals.
- The potential for risk to human health is the main criteria used by Conservation to assess the seriousness of contamination.
- The prioritization process is to:
  - receive environmental site investigation report;
  - review the sample taken for reasonableness; and
  - compare to *CCME Environmental Quality Guidelines*.
- Of the 2,170 sites tracked by Conservation in its database of sites, the classification of site status is shown in **Figure 2**.

FIGURE 2

**Manitoba Conservation
Contaminated Site Status
As At March 31, 2005**

Code #	Meaning	2004 Active Sites	Provincial Departments and SOA Sites
0	Report received no contamination above lowest level	80	-
1	Site identified, nothing to initiate	172	-
2	Preliminary assessment complete	491	3
3	Remediation underway	240	2
4	Site monitoring being undertaken	218	3
5	Site remediation completed and listed	827	17
6	Site clean file closed	142	-
7	General file	-	-
	Totals	2,170	25

Source: Manitoba Conservation

Note: Active sites are status 2, 3, 4 and 5 and information in these files is available to the public. Inactive sites are status 0, 1, 6 and 7. Information on status 0 and 6 sites is available to the public after review of the file.

- Of the total 2,170 sites tracked, only 25 sites are owned by provincial departments or SOAs. Of those 25 sites, 17 sites are classified as category 5 (site remediation completed) and are maintained on the database for tracking purposes. The remaining 8 sites are considered active and are classified as being either:
    - Category 2 (preliminary assessment completed);
    - Category 3 (remediation underway); and
    - Category 4 (site monitoring undertaken).
- As a result, Manitoba Conservation's database records of known impacted sites indicate eight sites owned by provincial departments or SOAs which have not been fully remediated.

4.1.6 Remediation Cost Estimates Are Not Available For Eight Sites

Observations

- Conservation is currently managing all identified sites and remediation is underway at two sites. However, Conservation does not have a current estimate of remediation costs for eight provincial department and SOA owned sites listed as "impacted" sites in the data base (including the two sites where remediation is underway). Their rationale is that these sites do not meet the criteria for "designation" as a contaminated site because the existing contamination is contained with no pathway to a receptor and the land use has not changed. As a result, in some cases, no remediation plans are developed and no potential cost estimate has been done.

- Conservation is currently reviewing options for funding and remediation of these sites.

4.1.7 Remediation Measures Are Prioritized Based On Human Health Risk

Observations

- Any remediation work conducted is prioritized by human health risk and the potential risk to the environment. Priority is given to any incident or site where the potential risk to human health is assessed as being present.
- Conservation officials explained that in the analysis of the Contamination > Pathway > Receptor relationship, the main risk factor is the pathway. Remediation efforts may involve interrupting the pathway to a receptor. Remediation in this manner could involve containment as opposed to clean-up. As well, the type of remediation is dependent on site use.

4.1.8 Risk Measures Are Evaluated To Ensure They Are Aligned With Current Standards And Practices

Observations

- The Province of Manitoba is a member of the CCME group and has a role in developing and evaluating the environmental quality guidelines which are the criteria used to measure risk.
- A working group of Environmental Officers within Conservation meet regularly to review and evaluate the policies and procedures used by them.
- Conservation evaluates the measures used relative to other Canadian jurisdictions to ensure continuity of standards.

4.2 O&A FUEL STORAGE SITES

In the process of our review we had the following objectives and reached the following conclusions.

Objectives	Conclusions
To determine whether adequate processes were in place to ensure that the Province was in compliance with key sections of the Contaminated Sites Remediation Act (CSRA) and other applicable Acts. In particular whether: • Processes for identifying O&A fuel storage sites for which the Province has a potential liability, were adequate to ensure timely knowledge of these sites; • A database of O&A fuel storage sites was complete and updated in a timely manner; • Criteria for designating a O&A fuel storage site as contaminated, under the Act, were consistent with those set by other jurisdictions in Canada.	The processes for identifying potential O&A fuel storage sites was not adequate to ensure timely and complete knowledge of those sites. The responsibility/liability for O&A fuel storage sites are not clearly defined. The province is not legally responsible for remediation. However, officials recognize that in the absence of a responsible party, the province will, in all likelihood, be responsible for remediation. CCME Guidelines are developed by all jurisdictions so that there are comparative criteria for evaluating sites.
To determine whether the Province's prioritization processes are adequate to ensure available financial resources were directed to the remediation measures that collectively benefited the environment the most.	The Province's prioritization processes were not adequate to ensure resources were directed to the remediation measures, for O&A fuel storage sites that would benefit the environment the most. Standardized criteria are used to classify risk for O&A fuel storage sites. However inspections and assessments using these criteria have not been completed for the majority of identified sites. Preliminary estimates (without inspections) of costs for remediation of O&A fuel storage sites have been quantified based on average expected costs. However actual inspections and assessments have not been carried out, to provide accurate estimates.

In reaching these overall conclusions, we specifically reviewed:

- Whether adequate and timely processes exist for identifying O&A fuel storage sites;
- How Conservation identifies and inventories its O&A fuel storage sites;
- How compliance with legislation is ensured by Conservation in relation to:
  - CSRA,
  - DGHTA, and
  - Petroleum Products Regulation;
- Whether criteria for designating an O&A fuel storage site as contaminated are comparable across jurisdictions in Canada;
- What criteria and processes are established to identify the risk in terms of environmental, health or safety risk and whether they are consistent with the Acts;
- How remediation measures are quantified in terms of cost;

- How remediation measures are prioritized - by environmental risk or cost to remediate or both; and
- How risk measures are evaluated.

4.2.1 There Is An Inadequate Process For Complete And Timely Identification Of O&A Fuel Storage Sites

Observations

- Under the current system in place since 1977 for registering fuel storage sites, when a site is closed, Conservation follows a mostly legislative (CSRA and DGHTA) directed process to identify the responsible party and to attempt to have the responsible party remediate the site and/or cover the cost of the remediation. A notice is sent to the last registered owner of a fuel storage site which is identified as inactive. Environmental Officers follow up where possible to identify last owners of sites. Inspections and assessment are done.
- As of April 1, 2005 new licensing standards for fuel storage have come into effect in Manitoba. These standards require a higher standard for the maintenance and condition of fuel storage sites. Conservation officials noted that as a result of new, more restrictive licensing standards there is a potential risk that current marginally profitable operators will abandon tanks rather that bring them up to the new standards.
- Based on a review of historic fuel storage registration records (pre 1977) and third party information, Conservation has identified approximately 500 inactive petroleum storage sites that have not been properly decommissioned. Conservation identified these as potential O&A fuel storage sites. Conservation originally compiled this list in 1999. The listing was updated in 2002 and it has not been updated since.
- Conservation has estimated that of the 500 potential O&A fuel storage sites that they have identified, approximately 50% (or 250 sites) will qualify as O&A sites, where the last registered owner of the site will not be able to be located, or will not have the financial resources to properly remediate the site.
- Prior to 1977, there was no registration requirement for fuel storage sites in Manitoba. Conservation acknowledges that the current listing of potential O&A fuel storage sites is likely incomplete. Sites that existed prior 1977 may not have been identified in the historical records.
- Conservation advised that in most cases, these sites have not been inspected or assessed by Environment Officers from Conservation. Until Conservation inspects and assesses these potential O&A sites, they cannot determine the complete, total number of O&A fuel storage sites that may exist in Manitoba.

4.2.2 Government Responsibility/Liability For O&A Fuel Storage Sites Is Not Clearly Defined

Observations

- Conservation advised that they have made the assumption that for the estimated 250 O&A fuel storage sites, where tank removal and/or site cleanup will be required, and where the last registered owner of the site will not be able to be located, or will not have the financial resources to properly remediate the site, the Province will be required to bear the cost of remediation.
- The responsibility/liability for O&A fuel storage sites is not clearly defined. Conservation has obtained a legal opinion that the Province is not responsible for remediation of these sites under the existing legislation. However, the Province has recognized that in the absence of a responsible party, the Province will, in all likelihood, be responsible for remediation.
- Where the Province performs remediation, there may still be some recourse against owners who can be identified, in order to recover funds spent by the Province.
- Until Conservation inspects and assesses these sites, and determines if a financially viable owner exists, it is not possible to accurately identify the province's potential responsibility for these sites.
- The Province does not currently have a program or plan in place to address the issue of O&A fuel storage sites. A plan is currently in development within Conservation to address this issue.
- Conservation is currently reviewing options for funding and remediation of these sites.
- No formal request from Finance has been made to Conservation to request an estimate of the potential liability for O&A fuel storage sites for the purposes of the Public Accounts estimation of environmental liability.

4.2.3 Criteria For Designating O&A Fuel Storage Site As Contaminated Is Comparable To Other Jurisdictions In Canada

Observations

- The Canadian Council of Ministers of the Environment (CCME) Guidelines have been developed by all jurisdictions and there are comparative criteria for evaluating sites. There is some variability in application of guidelines in other provinces due to different policies and priorities (e.g., based on potential development of lands). Contact with CCME members is also used when dealing with certain instances/cases – to compare methodology and criteria.

4.2.4 Standard Processes Have Not Been Performed To Classify Risk For O&A Fuel Storage Sites

Observations

- Conservation has a standardized process for assessing contaminated fuel storage sites.
- Conservation recognizes that the standardized process of inspecting and assessing the listing of 500 potential O&A fuel storage sites has not been performed for the majority of the identified sites. Therefore, they do not have sufficient information to estimate the potential risk to the environment for these sites.

4.2.5 Preliminarily Estimates Have Been Prepared For Remediation Measures Of O&A Fuel Storage Sites

Observations

- Conservation has been preparing an estimate of funding for initial assessment and remediation of these sites. As of June 2005, the estimate was for $13.75 million. It was estimated that the remediation (removal of tanks and decontamination of the site) for an O&A fuel storage tank site would cost, on average, $35,000 per site. However, officials stated that if fuel had leaked into groundwater, the cost of remediation of a site could be significantly higher depending on the location.
- Conservation's estimate of the cost of remediation for O&A fuel storage sites is based on the average cost of removal and clean-up. The cost may vary depending on circumstances encountered during removal.
- Until Conservation inspects and assesses these sites, it is not possible to prepare more accurate estimates for remediation for these sites.

4.2.6 O&A Fuel Storage Sites Are Not Prioritized For Remediation By Level Of Risk To The Environment

Observations

- Conservation noted:

  > *"It is imperative that the petroleum containment site clean-up issue be addressed as quickly as possible in that significant future environmental (contamination) will result, which would result in substantially increased clean-up/remediation costs being incurred."*

- Conservation officials stated that to prevent any possible further environmental risk, these sites should be inspected as soon as possible to identify tanks that may be still holding fuel so that these tanks could be emptied. This would remove the risk of future fuel leakage and resulting contamination of the site and groundwater therein.

- Conservation advised that an initial request for funding to carry out initial assessment and remediation of the identified sites was prepared in 2002, but was not submitted. Conservation indicated that they are currently in the process of developing program options to allow them to make progress in this area.

4.2.7 Risk Measures Are Evaluated For O&A Fuel Storage Sites To Ensure That They Are Aligned With Current Standards And Practices

Observations

- Manitoba is a member of the CCME group and has a role in developing and evaluating the environmental quality guidelines which are the criteria used to measure risk.
- A working group of Environmental Officers within Conservation meet regularly to review and evaluate the policies and procedures used by the Department.
- Conservation evaluates the measures used relative to other Canadian jurisdictions to ensure continuity of standards.

4.3 O&A MINE SITES

In the process of our review we had the following objectives and reached the following conclusions.

Objectives	Conclusions
To determine whether adequate processes were in place to identify O&A mine sites and to address environmental issues regarding O&A mine sites: • Processes for identifying and recording O&A mine sites for which the Province has a potential liability, were adequate to ensure timely knowledge of these sites; • The province identifies its responsibility/liability for O&A mine sites; • Means of addressing O&A mine sites are comparable with other jurisdictions in Canada; and • Remediation measures are quantified and prioritized by environmental risk.	The processes in the Mines Branch (Mines) for identifying potential O&A mine sites was not adequate to ensure timely and complete knowledge of those sites. Provincial legislation is not clear on responsibility and liability for O&A mine sites. However, the Province recognizes that in the absence of a responsible party, the province will, in all likelihood, be responsible for remediation. Given that there are no national standards for addressing O&A mine sites, each jurisdiction addresses their issues independently. Standardized criteria are used to prioritize environmental, health, and safety risk for O&A mine sites. However inspections and assessments using these prioritization criteria have not been completed for the majority of identified sites. Preliminary estimates of costs for remediation of O&A mine sites have been quantified. However actual inspections and assessments have not been carried out to provide accurate estimates. For those sites which have been inspected and assessed, the Province is targeting remediation at those sites they have classified as the highest risks in terms of environmental risk and public health and safety. The Province has received a warning from Environment Canada respecting an alleged violation of federal legislation as a result of pollution from O&A mine sites.

In reaching these overall conclusions, we specifically reviewed:

- Whether adequate and timely process exist for identifying and recording O&A mine sites;
- What process is established to identify the risk in terms of environmental, health or safety risk and whether they are consistent with the following:
  - CSRA,
  - The Mines and Minerals Act (MMA), and
  - Other applicable Acts and Regulations;
- How the Province identifies it's responsibility/liability in relation to O&A mine sites;
- Whether there are national guidelines for identifying and remediating O&A mines in Canada;
- How remediation measures are quantified in terms of cost; and
- How remediation measures are prioritized - by environmental risk or cost to remediate or both.

4.3.1 Mines Has Identified O&A Mine Sites, But Unidentified Sites May Still Exist

Observations

- Mines has identified 225 potential O&A mine sites which may present a risk to public safety and the environment and for which the cost of remediation of the site will likely be the responsibility of the Province. Of these sites, Mines has identified 149 sites for which the Province has formally accepted ownership and liability. No conclusion has been made on the remaining 76 sites.
- Mines has identified these potential O&A mine sites from a review of the registration of mineral leases. Mines stated that all mine site registrations since 1970 have been captured in branch databases, which contain records of closed mines and the last registered owners, where available.
- Prior to 1970, registration and ownership is documented in paper files dating back, in some cases, to the early part of the last century. In some cases, early documentation has been difficult to recover and, as a result, some unidentified O&A mine sites may exist.

4.3.2 No Specific Legislation Clearly Defines Liability for O&A Mines - Responsibility is Derived From Various Acts

Observations

- Unless specifically incorporated by regulation, mine sites are exempt under the CSRA. As per Section 3.3:

  > *"This Act does not apply to a site to which the provisions of The Oil and Gas Act or The Mines and Minerals Act respecting the rehabilitation of land apply."*

- In the fall of 2003, Mines analyzed provincial acts to determine which ones are applicable to O&A mine sites and how they are applicable to assist in determining if there are environmental liabilities that may exist regarding O&A mines.
- The following acts were determined to assign liability for O&A mine site remediation/rehabilitation, to varying degrees:
  - Mines and Minerals Act (MMA);
  - Environment Act;
  - Mining and Metallurgy Compensation Act;
  - Workplace Safety and Health Act; and
  - Crown Lands Act.
- In May 2005, Mines obtained an extract of a draft document, *Report on the Legislative, Regulatory, and Policy Framework Respecting Collaboration, Liability and Funding Measures in Relation to Orphaned/ Abandoned, Contaminated, and Operating Mines in Canada*. This document provides an interpretation of the Mines and Mineral Act. It indicates that the MMA defines a mine as including "abandoned mine

and abandoned mine tailings". However, the MMA does not define what an abandoned mine site or abandoned mine tailings are, and does not set out criteria for identifying these facilities.

4.3.3 Risk Assessments Have Not Been Completed Because Physical Inspections Have Not Been Conducted at all O&A Mine Sites

Observations

Inspections Conducted

- Mines has identified some 225 mine sites, over half of which were inspected during the 1970s, 1980s and 1990s primarily to assess public safety risk. A schedule for the inspection of the remaining sites has not been developed. As a result, Mines does not have timely information regarding any potential environmental contamination or the need for remediation of these sites.
- In Mines documentation titled, *Orphaned/Abandoned Mines Programs In Manitoba*, Mines noted that, *"mine sites have been inspected in a haphazard fashion over the years, with the majority of inspections being done in the 1970s and 1980s. These inspections mainly focused on ensuring that public safety issues had been addressed"* (e.g., capping mine shaft entrances).
- In 1998, Conservation identified five sites from the 225 potential O&A mines sites that they classified as having high environmental risk. Four of these are former mine and mineral processing sites. The fifth was a mine site only. Mineral processing sites are those sites where milling, concentrating, smelting and/or refining has occurred. In general, these sites carry the highest degree of environmental risk. Mines advised that the majority of the remaining 220 sites are moderate or low risk mining and advanced exploration sites.
- In 1998, Mines produced a document, *Strategy Document for the Rehabilitation of Orphaned and Abandoned Mine Sites in Manitoba*. This document indicates that inspections were made of a number of O&A mine sites in 1996/97 by Mines staff in consultation with other departments. In this document, certain sites were identified where public safety hazards and/or environmental degradation was present and required urgent attention.
- The 1998 strategy document stated, *"...inspections of a number of orphaned mine sites were carried out by Mines staff in consultation with personnel of the Departments of Environment, Natural Resources, Northern Affairs and Labour"*. Additionally, others who participated included Environment Canada, local community councils First Nations, engineering consultants and contractors.
- Those mine sites were prioritized with regard for public health and safety, and the potential for further environmental damage to immediate surrounding lands and waterways.

- In July 2000, Treasury Board approved funding, under IEDM administration, in the amount of $1.0 million over four years to address the immediate public safety concerns at those five sites identified as being of high risk.
- Mines advised that in 2001, Treasury Board approved additional funding in the amount of $1.0 million over four years, under the administration of Conservation, to conduct environmental and health risk assessments at the same five high priority sites, and to guide development of remediation strategies. Conservation completed Site Specific Human and Environmental Risk Assessments at two of these sites. The responsibility for monitoring of these sites was subsequently reassigned to Mines.

Risk Assessments Not Yet Conducted on Remaining Sites

- Approximately half of the 225 O&A mine sites identified have never been inspected. The five high priority sites previously mentioned carry the highest degree of environmental risk based on current information in Mines files. Therefore, Mines do not have sufficient information to estimate the potential risk to the environment for the remaining 220 sites.

Process For Currently Operating Mines

- The Mine Closure Regulation came into force in 1999 (see **Section 4.3.5**) and changed the process. Mines indicated that enforcement of this regulation includes an inspection process for those mines currently operating or being closed. Mines assesses if there are environmental concerns that need to be addressed in addition to those addressed in closure plans. Other sites such as quarries and pits are not identified under this process but fall under other Provincial regulations. The potential liability that may exist for the government for these sites has not been assessed.

4.3.4 The Province Has Received A Warning From Environment Canada Respecting An Alleged Violation Of Federal Legislation As A Result Of Pollution From O&A Mine Sites

Observations

- During the course of our review, we examined documentation identifying that the Province is currently in violation of the Federal Fisheries Act, in relation to discharge of deleterious substances into water frequented by fish from two O&A mine sites, for which the Province has assumed responsibility.
- Environment Canada issued two notices of "Warning Respecting An Alleged Violation". These were issued to IEDM and Mines (including the Deputy Minister of IEDM) on May 31, 2002. Mines has provided a response to Environment Canada which outlines actions and plans at

both sites, and the plans and schedules for additional remediation work. Annual updates of their condition and their activities is also provided to Environment Canada.

- These violations related to the Sherridon and Lynn Lake O&A mine sites as a result of water being discharged and from ground runoff. These situations are in violation of the Federal Fisheries Act - Section 36(3).
- The Province has accepted responsibility for the Sherridon mine site and partial responsibility for the Lynn Lake mine site. Two other companies have accepted responsibility for certain aspects of the environmental liability for Lynn Lake.

4.3.5 Provincial Responsibility/Liability For O&A Mine Sites Has Been Defined

Observations

- Mines has assumed that for the estimated 225 O&A mine sites, where site remediation will be required, and where the last registered owner of the site will not be able to be located, or will not have the financial resources to properly remediate the site, the Province will be required to bear the cost of remediation.
- Legal ownership has been determined for the majority of the 225 sites. At 149 sites ownership has reverted to the Province. The legal owner of the remaining 76 sites have not been sought out to determine if the present owner is still locatable and financially able to remediate the site.
- IEDM has attempted to clarify IEDM's understanding of the Province's responsibility in relation to O&A mine sites. In this effort, officials of IEDM indicated that:
    - The Mine Closure Regulation under the Mines and Minerals Act (MMA) came into force in 1999. Under the regulation mining companies are held liable for the full cost of all rehabilitation measures for their mine sites. This regulation requires submission of a closure plan which details plans for site remediation upon closure and financial security for accrued liabilities.
    - However, for many O&A mine sites, rehabilitation has either not been carried out, or does not meet current environmental standards. Mines has identified O&A mine sites as falling into three broad categories:
        - Sites where the Province has formally accepted ownership and liability;
        - Sites where the former owner no longer exists or does not have the financial resources to rehabilitate the site; and
        - Sites where rehabilitation was completed to the standard that existed at the time, but due to a subsequent complicated

history of ownership and neglect has resulted in a complex and uncertain liability framework.

4.3.6 There Are No National Standards For O&A Mines

Observations

- There are presently no national standards for identifying, assessing or remediating O&A mine sites.
- Mines staff work on committees with staff from other jurisdictions on the National Orphaned/Abandoned Mines Initiative (NOAMI). NOAMI was organized after a multi-stakeholder workshop was held in Winnipeg in 2001 to review the issues of O&A mines and priorities for action. Mines advised that NOAMI is currently working on a risk classification system for O&A mines, however Mines has not adopted that system yet.

4.3.7 A Preliminary Estimate of $61.5 Million Has Been Identified As the Potential Provincial Liability for O&A Mine Sites

Observations

- A preliminary estimate of $61.5 million for the potential liability to the Province for O&A and closed mine sites was prepared by Mines in April 2005.
- Funding of only $2 million over two years (2005/06 and 2006/07) was requested by Mines primarily for the inspection of the 225 identified O&A mine sites, and to continue remediation at two of the five high priority sites. Mines advised that the majority of the remaining 220 sites are moderate to low risk exploration sites. The remaining $59.5 million was not requested for funding at that time.
- Mines officials indicated that if site inspections are funded, as proposed by their preliminary estimate, the potential liability to the Province of $61.5 million could increase as a result of better knowledge of each site's status.

4.3.8 O&A Mine Sites Are Prioritized For Remediation by Public Health, Safety and Environmental Impact

Observations

Initial Prioritization for Remediation

- In 1998, Mines prepared a *Strategy Document For The Remediation Of Orphaned And Abandoned Mine Sites In Manitoba*. This stated, "*Four orphaned mine sites have been identified as requiring rehabilitation. The sites have been prioritized with due regard for public health and safety, and potential for further environmental damage to immediate and surrounding lands and waterways*". Two additional priority sites (one of which was later combined with another high priority site) were also identified, however cost estimates had not yet been determined.

- In July 2000, a funding request from IEDM was approved in the amount of $1.0 million over four years to address the immediate public safety concerns at five sites identified as being of high risk. Two of the previously identified sites were combined into one site.
- Mines advised that, in 2001, Treasury Board approved additional funding in the amount of $1.0 million over four years, under the administration of Conservation, to conduct environmental and health risk assessments at the same five high priority sites, to guide development of remediation strategies.

Current Planned Remediation

- Over the past five years work has been carried out on the critical safety and environmental aspects at five sites which were identified as high priority sites.
- A program was initiated by Mines in 2001/02 to identify the location, ownership, previous inspections carried out, and to determine the status of all existing mine sites in Manitoba. Over 225 mine sites were identified of which 149 are category one sites where the Crown has formally accepted ownership.
- Pursuant to the Workplace Safety and Health Act, Chapter w210, Manitoba Regulation 228/94 Sec.(19), (20), (21), Manitoba has a legal obligation to inspect these inactive mine sites on an ongoing basis and to take corrective measures to mitigate the public safety hazards and the environmental degradation of the surrounding area.
- Mines has identified funding requirements for site inspections and emergency work for these 149 sites.
    - The site inspection will focus on physical safety and environmental conditions.
    - The reports will provide recommendations and cost estimates for compliance and to mitigate safety concerns and environmental degradation.
    - Recommendation and justification will be made to secure funding to rehabilitate high priority sites.
    - During the course of the inspection there is a probability that a few sites with serious implications for public safety and environmental impact may be found. Those deficiencies found during the inspection must be mitigated in an efficient manner.
- Mines has identified a preliminary estimate of $61.5 million for the potential liability to the Province for all O&A mine sites. As noted in **Section 4.4.2**, $59.5 million of this liability is estimated to relate to additional work at four sites which have been identified as high priority sites due to environmental risk. Work is complete at one of the previously identified four sites, however a risk assessment will be done which may result in additional work.

- In the case of immediate safety concerns, Mines funds remediation efforts from their operating budget and financial resources are used to address public health and safety issues first. Officials of Mines indicated that remediation work is prioritized by human health risk and potential risk to the environment. However, officials noted that currently, they are reactive in addressing concerns brought forward by the public.

4.4 GOVERNMENT LIABILITY FOR PUBLIC ACCOUNTS REPORTING

In the process of our review we had the following objectives and reached the following conclusions.

Objectives	Conclusions
Reporting for environmental liabilities as result of provincial ownership or responsibility for sites was/is in compliance with recent PSAB liability and contingent liability recognition standards. To determine whether the processes for estimating the costs associated with provincial department and SOA owned contaminated sites and O&A fuel storage and mine sites were adequate to ensure reasonable estimates of the Province's liability for appropriate reporting in the Public Accounts.	The Province met the standards for reporting environmental liabilities that were in effect for the 2003/04 and 2004/05 Public Accounts, but is not fully positioned to quantify the environmental liabilities that will need to be either recorded or disclosed in the 2005/06 Public Accounts in accordance with recent PSAB liability and contingent liability recognition standards. The Province does not have an adequate plan and process for quantifying its liability in the Public Accounts for department owned and SOA contaminated sites, and O&A fuel storage and mine sites for the year ending March 31, 2006. Potential liabilities are based on preliminary estimates and complete costs cannot be accurately estimated until more detailed site assessments are performed and remediation actually begins.

In reaching these overall conclusions we reviewed whether:

- Current financial statement disclosure in Manitoba is in compliance with PSAB standards.
- Planned financial statement disclosure in Manitoba for future years will be in compliance with PSAB standards.
- There will be a reasonable estimate of environmental liability determined for recording in the Public Accounts for 2005/06 relating to:
    - Department and SOA owned sites;
    - O&A fuel storage sites;
    - O&A mine sites; and
    - How the various departments coordinated their efforts in determination of liabilities.

4.4.1 Manitoba is Presently In Compliance With Current Reporting Standards for the Recording and Disclosure of Environmental Liabilities in the Public Accounts

Observations

- The Province of Manitoba provided note disclosure of environmental liabilities in the 2003/04 and the 2004/05 Public Accounts (see **Section 3.7**).
- In addition to note disclosure, the Province also recorded an accrual for $5.0 million a number of years ago, relating to its recognized liability for containment of tailings at a closed mine site for which the Province has responsibility. This was pursuant to a legal agreement with the mine operator which capped the environmental liability exposure to the operator after the shut down of the mine. The accrual remains as an accounts payable in the Public Accounts.
- Other than the $5.0 million accrual above, no other specific provision has been recorded for potential environmental liabilities as described in the preceding sections of this report.

4.4.2 Manitoba Does Not Have An Adequate Plan And Complete Estimates To Ensure Compliance With the Recording And Disclosure Of Environmental Liabilities Required For The Year Ending March 31, 2006 In The Public Accounts

Observations

- We were unable to confirm that Finance has an adequate plan in place to meet liability recording standards for the 2005/06 reporting period.
- Finance officials advised that they had made verbal requests to the financial officers of Conservation and IEDM for estimates of their respective potential environmental liabilities. There is no correspondence of such requests.
- Finance stated that no set procedure or plan has been established to define responsibility and co-ordination for the development of a "catalogue" of sites as referred to in the note to the 2003/04 and 2004/05 Public Accounts, regarding potential environmental liability.
- We noted from our examination that a number of departments maintain staff positions with responsibility for environmental issues. For example, the Departments of Conservation, Transportation and Government Services, and Agriculture, Food and Rural Initiatives have such staff positions. However there was no coordination of these resources in identifying potential environmental liabilities for the Province.

- Preliminary, incomplete estimates of environmental liabilities totaling approximately $75 million are as follows:
  - Provincial Department and SOA Owned Sites - dollar amount unknown;
  - O&A Fuel Storage Sites - $13.75 million; and
  - O&A Mines Sites - $61.5 million.
- By comparison, the Federal Government identified 2,200 contaminated sites with an estimated potential liability of $3.4 billion in their Public Accounts for March 31, 2004.

Provincial Department and SOA Owned Sites

- Finance has assumed that Conservation has the lead role in identifying provincial department and SOA owned contaminated sites. However, Conservation does not specifically track provincial sites and has not estimated costs for the potential remediation of these sites. Conservation cannot be assured that the processes in place will identify all applicable provincial department and SOA owned sites that may exist.
- Conservation has not developed an estimate for the eight identified department and SOA owned contaminated sites. The inventory of sites may be incomplete and no assessment for cost of remediation has been done. Conservation has not provided for an estimate in the Public Accounts to date.
- During the course of our review, we noted that there is the possibility that the Province may have liabilities associated with health and safety issues relating to asbestos and mould in provincial department and SOA facilities.

O&A Fuel Storage Sites

- Conservation has prepared an estimate of the potential cost of assessments and remediation of O&A fuel storage sites of $13.75 million. The estimate is based on preliminary information without environmental assessments being done for the majority of the 250 sites identified.
- Senior officials of Conservation stated that many of these numbers are difficult to quantify from a speculative basis, and true costs cannot be ascertained until the work of assessment and remediation actually begins.

O&A Mine Sites

- Mines has prepared a current estimate of liability for O&A mine sites. This estimate has received their Minister's approval. Conservation has completed Site Specific Human and Environmental Risk Assessments at two O&A mine sites. The estimate is to conduct environmental and health risk assessments at high priority sites and to guide development of remediation strategies. As noted in the working document, the

> *"funding requirements in 2007/08 and 2008/09 are preliminary and may vary pending results of risk assessments to be conducted by Manitoba Conservation this year".*

- The estimate, dated April 2005, identifies the environmental liability for remediation of the sites as $61.5 million which includes:
    - $2 million - preliminary estimate of costs for site assessment for 149 inactive mine sites;
    - $21 million - based on a high level (level 1) remediation estimate done for one mine site (Sherridon);
    - $6.5 million - based on a preliminary (level 2) site assessment which is not complete for one mine site (Gods Lake);
    - $2 million - based on preliminary (level 2) estimates for one mine site where no environmental assessment is done yet (Snow Lake); and
    - $30 million for long term rehabilitation for one mine site where rehabilitation strategy and (level 3) environmental assessment has been completed (Lynn Lake).

4.4.3 Status Of Reporting Practices For Environmental Liabilities In Canadian Jurisdictions As At March 31, 2004

Observations

- **Figure 3** illustrates which Canadian jurisdictions (including the federal government) fully accrued or partially accrued environmental liabilities in their Public Accounts for the year ending March 31, 2004. It also indicates whether a note on environmental liabilities was included as part of the financial statements for their Public Accounts. For jurisdictions that had not accrued or partially accrued environmental liabilities as at March 31, 2004, the chart indicates which of those jurisdictions plan to accrue for environmental liabilities in the future.

FIGURE 3

Current Practice on Providing For and Disclosing Environmental Liabilities As at March 31, 2004

Jurisdiction	Accrual in Public Accounts			Note Disclosure	Plans to Quantify and Book
	Fully	Partially	No		
British Columbia		X		Yes	Yes
Alberta	X			No	
Saskatchewan	X			No	
Manitoba			**X**	**Yes**	**Yes**
Ontario	X			Yes	
Canada	X			Yes	
Yukon			X	Yes	Yes
Northwest Territories			X	Yes	Yes
Nunavut			X	Yes	Yes
Quebec			X	No	No
New Brunswick			X	Yes	No
Nova Scotia	X			Yes	
Prince Edward Island	X			Yes	No
Newfoundland and Labrador			X	Yes	Yes

Source: Jurisdiction Information

- From a review of **Figure 3**, six jurisdictions indicated that they were fully accruing environmental liabilities. Four of those six jurisdictions also provided note disclosure in their Public Accounts.

5.0 Recommendations

5.1 FOR THE PROVINCE OF MANITOBA

Accountability Framework - Identification of Contaminated Sites - Assigning Responsibility

- That the Province of Manitoba (Province) look to best practices in other jurisdictions and develop an accountability framework for provincial contaminated sites that includes formal assignment of operational responsibility for:
    - Identification of sites;
    - Inspection and assessment of sites;
    - Performance reporting on management of sites;
    - Quantification of environmental liabilities regarding contaminated sites; and
    - Reporting of environmental liabilities in the audited financial statements of the Public Accounts.

5.2 FOR THE DEPARTMENT OF CONSERVATION

Operational – Department Owned and SOA Sites

- That the Department of Conservation (Conservation), as the department tasked with ensuring compliance with the CSRA, establish a documented protocol, including a more formal communication process with all other provincial departments and SOAs, to ensure timely and complete:
    - Identification and recording of sites with potential environmental impact;
    - Reporting of any change in site status in the year; and
    - Reporting of estimated costs for remediation of the site if required.

- That Conservation implement a support and training process to assist provincial departments and SOAs in the identification and reporting of potentially contaminated sites.

- That Conservation specifically identify and track provincially owned sites within the database of contaminated sites.

Operational – O&A Fuel Storage Sites

- That Conservation continue to review fuel storage licensing records to identify all potential O&A fuel storage sites resulting from the new changes to the licensing requirements.

- That Conservation develop a program to address the issue of O&A fuel storage sites which could include:
    - Conducting a comprehensive inventory of sites;
    - Assessing the need for remediation of identified sites;
    - Identifying the legal owner and determining if they can carry out remediation; and

  - Priorizing sites in need of remediation where no legal or financially viable owner can be identified.

- That the status of O&A fuel storage sites be regularly reviewed to ensure the timely update of information.

Financial – Department Owned and SOA Sites

- That Conservation obtain estimates of remediation costs of the eight known impacted sites and any additionally identified contaminated sites owned by provincial departments and SOAs, for the purposes of estimating the potential financial environmental liability of the Province.

- That Conservation ensure that complete contaminated site information and the related financial estimates of environmental liability are prepared and submitted annually to the Comptroller's Office of the Department of Finance (Finance) for the recording and disclosure of environmental liabilities.

Financial – O&A Fuel Storage Sites

- That Conservation perform environmental inspections and assessments of known O&A fuel storage sites to provide more accurate assessments. Those assessments will enable Conservation to more accurately identify and prioritize those sites which the Province may be responsible for, and to quantify the cost of the future remediation of those sites.

- That Conservation ensure that complete O&A fuel storage site information and the related financial estimates of environmental liability are prepared and submitted annually to the Comptroller's Office of Finance for the recording and disclosure of environmental liabilities.

5.3 FOR THE DEPARTMENT OF INDUSTRY, ECONOMIC DEVELOPMENT AND MINES

Operational – O&A Mine Sites

- That Mines continue to perform environmental inspections and assessments of those sites not inspected and assessed to date. This will enable them to have a better knowledge of each site in order to prioritize the remediation of those sites, and to quantify the cost of the future remediation of those sites which may become the responsibility of the Province.

- That Mines develop a documented program to address the issue of O&A mine sites which could include:
  - Conducting a comprehensive inventory of sites (improve on knowledge to date);
  - Assessing the need for remediation of identified sites;
  - Identifying the legal owner and determining if they can carryout remediation;

  - Priorizing sites in need of remediation where no legal or financially viable owner can be identified; and
  - Addressing the environmental health and safety risk and costs of not remediating O&A sites.
- That the status of O&A mine sites be regularly reviewed to ensure the timely update of information.

Financial – O&A Mine Sites

- That Mines ensure that complete O&A mine site information and the related financial estimates of environmental liability are prepared and submitted annually to the Comptroller's Office of Finance for the recording and disclosure of environmental liabilities.

5.4 FOR THE DEPARTMENT OF FINANCE

Estimation of Liability for 2005/06

- That Finance develop an expanded accounting policy for the recording of environmental liabilities that addresses when the Province will recognize a liability (e.g., if it is likely to be liable to clean up a site due to public health and safety, contractual arrangements, or standards set in legislation or regulations).
- That Finance outline for use by Departments and SOAs, an environmental liability identification process that could include answering the following questions:
  - Is there damage to the environment?
  - Does the damage result in an environmental cost?
    - If "Yes", measures are necessary for health and safety reasons; or
    - There is a good possibility of a negative impact even though there is no immediate threat to the environment.
  - Does the entity have a responsibility (e.g., laws, regulations, agreements, promises, moral commitment)?
  - How is the fact presented in the financial statements?
    - High probability of the event and reasonable possibility of estimate, then a liability in the financial statements;
    - If "No" to the above, then note disclosure as a contingency in the notes to the financial statements.
  - If "No" to the first three bullets, then no mention in the financial statements is needed.
- That Finance communicate their requirements to Departments and SOAs to ensure that Finance receives complete and accurate estimates of environmental liabilities for reporting in the 2005/06 Public Accounts.
- That Finance further follow-up and explore the potential liability associated with health and safety issues resulting from asbestos and mould in provincial department and SOA facilities.

Response from Officials

The Province is committed to ensuring that adequate processes are in place to enable the proper management and reporting of its environmental remediation liabilities.

Recommendation 5.1: Accountability Framework - Identification of Contaminated Sites

The Province will review its current practices for managing provincially owned contaminated sites and take required action to develop and implement a cross-government framework for the management of provincially owned contaminated sites that is consistent with best practices in other jurisdictions. This may include assigning of responsibility for management of provincially owned contaminated sites to one department. This could also include expanding on the current processes for prioritizing provincially owned contaminated sites based on a risk assessment of public safety and regulatory concerns, to ensure that remediation efforts are directed towards prioritized sites. The framework will include a requirement for a central up-to-date repository of contaminated site information related to provincially owned sites, including identification of the department that has been assigned responsibility for remediation. This information will support site prioritization and any financial reporting requirements related to the recording of environmental liabilities. Detailed remediation plans which indicate the nature and timeline for remediation activities will be prepared as considered necessary, and departmental progress towards achieving planned activities will be monitored centrally.

Recommendation 5.2: Operational - Department Owned and SOA Sites

As noted in the response to Recommendation 5.1, the Province will undertake a review to determine the merits of this recommendation within the widely accepted parameters of adhering to a risk-based approach to managing sites. Such a review will be undertaken by the Insurance and Risk Management Branch in consultation with affected departments and Treasury Board.

Conservation's responsibility under existing legislation is to be the provincial regulator related to all contaminated sites in the Province. Conservation does not have a mandate to direct the management of sites owned by other government departments and SOAs. The responsibility for site management currently resides with the department or SOA that owns the site. However, these sites are currently tracked as part of the overall approach within the contaminated sites program, but were not specifically identified as such. The current program considers risk as the primary driver for prioritizing which sites receive the most attention by the department, whether or not they are provincially owned.

As part of the overall accountability framework for the management of provincially owned sites, if it is determined that a coordinated internal approach is required, then it will be necessary to ascertain what department or agency would be best situated to undertake such a responsibility.

Recommendation 5.2: Operational - O & A Fuel Storage Sites

Conservation agrees with the recommendation to continue to review fuel storage licensing records to identify all potential O&A fuel storage sites resulting from the new changes to licensing requirements.

Conservation will review its program for O&A fuel storage sites in the areas identified in the recommendation.

Recommendation 5.3: Operational - O & A Mine Sites

Mines will continue with programs as planned for the five High Risk sites. Once inspected, the remaining sites will be prioritized using a Risk Assessment Process and Mines agrees to review the pace of remediation and develop a long-term plan to address the sites of highest risk. The implementation of the updated Mine Recording System will allow for the timely update of information and review of the status of all sites.

Mines site information and related financial information will be forwarded to the Provincial Comptroller's Office on an annual basis.

Recommendation 5.4: Estimation of Liability for 2005/06

Finance (Comptroller's Division) is in the process of finalizing an accounting policy and guidelines for recognition of environmental liabilities in the Province's financial statements. The policy is being developed based on a review of best practices in other jurisdictions and after considering guidance provided by the Institute of Chartered Accountants (CICA) and other recognized financial standard setting bodies. The accounting policy will be consistent with the new PSAB accounting standards for recognition of liabilities and contingent liabilities in a government's financial statements.

Finance is working with impacted departments to provide direction on the implementation of the accounting policy requirements in order to enable a complete and accurate estimate of the Province's environmental liabilities for recognition in the 2005/06 financial statements.

A process will also be developed to facilitate updating and revaluation of the Province's environmental remediation liabilities on an annual basis for financial reporting purposes.

Appendix A

GLOSSARY OF TERMS

Contaminant	In relation to a site, means any product, substance or organism that is foreign to or in excess of the natural constituents of the environment at the site, and that: (a) has affected, is affecting, or may affect the natural, physical, chemical, or biological quality of the environment; or (b) is, or is likely to be, injurious or damaging to the health or safety of a person.
Contaminated Site	A site, designated under the CSRA, where contaminants are present at a level which poses or may pose a threat to human health or safety or the environment.
Costs of Remediation	In relation to a contaminated site, include a) costs reasonably incurred by the government to i) investigate the site for the purpose of determining the existence, nature or extent of the contamination and report the results of the investigation, ii) review a proposed apportionment agreement in respect of the site, iii) participate in any hearing, other than the hearing of an appeal, conducted by the commission in respect of the site, iv) review or prepare a remediation plan for the site, or v) effect remediation of the site, whether or not a remediation order has been issued in respect of the site, or monitor the progress of remediation carried out by others, b) the commission's costs of reviewing a remediation plan or conducting a hearing in relation to the site, as determined by the commission; c) costs reasonably incurred by a person to carry out his or her obligations under an investigation order [other than an order made under clause 6(b)] or an order under section 15 or to effect remediation under a remediation order; and d) any other costs prescribed by regulation or approved by order of the director or by order of the commission under subsection 27(2).

Appendix A
(cont'd.)

GLOSSARY OF TERMS

Environment	All or any part or combination of the air, land and water, and includes plant and animal life.
Environment officer	An environment officer appointed under section 54; of the CSRA.
Groundwater	All water under the surface of the ground.
Impacted Site	A site where contaminants are present in concentrations above background levels, but which does not pose a threat to human health or safety or the environment.
Owner	In relation to land, means a) where the land is under The Real Property Act, a person who i) is registered as the owner of an estate in fee simple or a life estate in the land, or ii) has filed a caveat in the land titles office for the district in which the land is situated claiming an interest in the land as purchaser, b) where the land is under The Registry Act, a person who i) is the owner of an estate in fee simple or a life estate in the land, or ii) as a purchaser of the land, has registered an agreement for sale in the registry office for the district in which the land is situated, and c) in the case of Crown land, a person shown in the records of the department of the government responsible for the administration of the land as having an estate or interest in the land.
Public Accounts	The Financial Statements of the Province of Manitoba, or any other senior government in Canada. The fiscal year end for the Public Accounts is March 31 of each year.
Remediation	The improvement of a contaminated site to prevent, minimize or mitigate damage to human health or the environment. Remediation involves the development and application of a planned approach that monitors, removes, destroys, contains or otherwise reduces availability of contaminants to receptors of concern.
Remediation Order	An order made under subsection 17(1) or (3), and includes any amendment to the order.

Appendix A
(cont'd.)

GLOSSARY OF TERMS

Responsibility for Remediation	The responsibility of a person to do anything required to effect remediation of a contaminated site or to contribute financially to the costs of the remediation.
Risk Management	Methods employed at a site to confine, control, monitor, or otherwise minimize the potential negative effects of contaminated media at the site. This is considered to be a form of remediation.
Site	An area of the environment.
SOA	A "Special Operating Agency" of the Government of Manitoba.
Trustee	In relation to a person, includes: a) if the person is deceased, the personal representative of the person; b) if the person has a beneficial interest in property, another person who has legal ownership of the property and who is charged with the administration of the property for the benefit of the person with the beneficial interest; and c) a trustee in bankruptcy charged with the administration of assets and liabilities of the person.

Appendix B

MANITOBA CONSERVATION WEB SITE

http://www.gov.mb.ca/conservation/regoperations/contams/standards/index.html

Criteria/Standards and Guidelines

Manitoba Conservation has adopted the following **Criteria and Standards**:

1. CCME Canada Wide Standard for Petroleum Hydrocarbons in Soil
2. CCME Environmental Quality Guidelines
3. Canadian Drinking Water Quality Guidelines

If you are unsure of the requirements or criteria to be used for a particular site please call the regional office for that site or HQ Operations in Winnipeg at 945-7009.

Guidelines

Manitoba Conservation has produced several guidelines and informational bulletins so that clients and consultants can understand the requirements for being in compliance with the legislation.

Manitoba Conservation has adopted the following Guidelines:

- Treatment and Disposal of Petroleum Contaminated Soil
    - Guideline 96-05, June 1996, Revised April 2002 (227 Kb PDF)
    - Directives 96-05, June 1996, Revised April 2002 (en français) (222 Kb PDF)
- Criteria for Acceptance of Contaminated Soil at Licensed Waste Disposal Grounds
    - Guideline 2002-02E, May 2002 (118 Kb PDF)
    - Directives 2002-02E, May 2002 (en français) (131 Kb PDF)
- Environmental Site Investigations in Manitoba
    - Guideline 98-01, June 1998, Revised May 2002 (233 Kb PDF)
    - Directives 98-01, June 1998, Revised May 2002 (en français) (237 Kb PDF)
- Guideline for Designation of Contaminated Sites in Manitoba
    - Guideline 97-01E, Revised January 2004
    - Lignes directrices 97-01F, Revised January 2004

Submission of Remedial Action Plans

- Information Bulletin 96-02E
- Bulletin d'information 96-02F

Appendix C | ENVIRONMENTAL SITE INVESTIGATIONS

Guideline 98 - 01

ENVIRONMENTAL

SITE INVESTIGATIONS

IN

MANITOBA

June 1998

Revised May 2002

Protecting
& Managing
our Future

Manitoba
Conservation

ENVIRONMENTAL SITE INVESTIGATIONS

Appendix C
(cont'd.)

PREFACE

This Guideline provides information and direction on the methods and protocols considered acceptable by Manitoba Conservation for the investigation of sites where the quality of groundwater, surface water, sediments and/or soil may have been affected by contaminants as result of past or present usage of the site.

The Guideline has been developed as a reference document for the use by environmental consultants, industry stakeholders, and the general public. The contents of this document include procedures for the investigation and characterization of sites which may possibly be contaminated sites; the requirements and regulations relating to the management of contaminated sites; and the procedures site stakeholders should follow in order to comply with existing government regulations.

This Guideline replaces the existing Manitoba Conservation document entitled, "A Guideline for the Investigation and Remediation of Petroleum Storage Sites in Manitoba, dated July, 1993". The 1998 document focuses not only on petroleum impacted sites, but encompasses the requirements for the investigation of sites potentially impacted by various contaminants. The Guideline reflects the principles established by the Canadian Council of Ministers of the Environment (CCME) for the management of sites in Canada and the requirements of *The Contaminated Sites Remediation and Consequential Amendments Act*, (CSRA) of Manitoba.

With the enactment of the CSRA, the term "contaminated site" now has a specific meaning in Manitoba. The definition is found in section 1.3. The generic term "site" has been used throughout this document to mean any location, whether a designated contaminated site or not, that may be subject to the processes described herein. Where the term "contaminated site" is used, it refers only to sites designated under the CSRA.

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ENVIRONMENTAL SITE INVESTIGATIONS

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1.0 INTRODUCTION

The Guideline for the Environmental Site Investigations in Manitoba, hereafter referred to as the Guideline, has been developed by Manitoba Conservation to assist stakeholders in understanding the technical and environmental issues associated with sites that may have been affected by contaminants. The Guideline is intended to provide environmental consultants with a baseline for conducting site assessments, characterizing sites and for developing applicable risk-based remedial action and management plans.

The investigative procedures are described in general terms on the assumption that site investigations will be conducted by qualified environmental professionals who are capable of adapting these procedures to deal with site specific conditions. Any major deviations from the Guideline are subject to review by Manitoba Conservation prior to their implementation.

Although this Guideline is not in itself a legally enforceable standard, parts of the document may be referenced in orders issued by Manitoba Conservation, which are legally enforceable.

1.1 Objectives

The principle objective of the Guideline is to provide direction for the investigation of sites where soil, sediment, surface water, and groundwater may have become impacted by contaminants. The Guideline also establishes a process whereby the party responsible for a contaminated site can work with the regulatory authority to ensure the protection of human health, safety, and the environment in an economically feasible and sustainable manner. Based on the completion of a site investigation and following the procedures outlined in this document, decisions regarding the designation of a site as contaminated, and the necessity for any management or remedial actions, will be made under the guidance and authority of *The Contaminated Sites Remediation Act* (CSRA).

1.2 Background

The preparation of this Guideline included a review of various regulatory approaches to the environmental investigation and risk management of sites. The document was developed specifically for application to the highly variable geographic, geological, and environmental conditions present within the Province of Manitoba. One of the purposes of the Guideline is to provide a standard approach to site investigations that will ensure that the results can be applied consistently within the framework of the CSRA.

1.3 Definitions

The following section provides a number of definitions used in this Guideline.

"Contaminant" in relation to a site, means any product, substance or organism that is foreign to or in excess of the natural constituents of the environment at the site, and that:

(a) has affected, is affecting, or may affect the natural, physical, chemical, or biological quality of the environment; or
(b) is, or is likely to be, injurious or damaging to the health or safety of a person.

"Contaminated Site" means a site, designated under the CSRA, where contaminants are present at a level which poses or may pose a threat to human health or safety or the environment.

"Department" means Manitoba Conservation.

"Groundwater" means all water under the surface of the ground.

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ENVIRONMENTAL SITE INVESTIGATIONS

"Impacted Site" means a site where contaminants are present in concentrations above background levels, but which does not pose a threat to human health or safety or the environment.

"Remediation" means the improvement of a contaminated site to prevent, minimize or mitigate damage to human health or the environment. Remediation involves the development and application of a planned approach that monitors, removes, destroys, contains or otherwise reduces availability of contaminants to receptors of concern.

"Risk Management" means methods employed at a site to confine, control, monitor, or otherwise minimize the potential negative effects of contaminated media at the site. This is considered to be a form of remediation.

2.0 ASSOCIATED MANITOBA LEGISLATION AND GUIDELINES

This Guideline is intended to be applied in conjunction with existing Manitoba Conservation legislation dealing with sites and guidelines concerning hazardous waste and chemical storage. Specific guidelines/legislation which may have some relation to this Guideline are described in the following sections.

2.1 *The Contaminated Sites Remediation Act*

The CSRA provides a system for identifying and designating contaminated sites in Manitoba, and a means for identifying appropriate remedial measures, if any, to be undertaken in relation to specific sites. The CSRA also provides a fair and efficient process for apportioning responsibility for remediation of contaminated sites. Information regarding the processes involved in the designation of contaminated sites is provided in:

- Guideline for the Designation of Contaminated Sites in Manitoba (March 1997)

2.2 Petroleum Storage Program

Manitoba Conservation maintains records of existing, operating, and decommissioned petroleum storage sites within the Province of Manitoba through the Manitoba Conservation Petroleum Storage Program. Relevant documents pertaining to the Petroleum Storage Program include:

- *The Dangerous Goods Handling and Transportation Act* - Regulation188/2001, Storage and Handling of Petroleum Products and Allied Products Regulation
- A Guideline for the Dismantling and Removal of Underground and Aboveground Petroleum Storage Tank Systems in Manitoba (January 2002)
- Bulletin: Testing of Underground Petroleum Storage Tank Systems (January 1996)

2.3 Hazardous Waste Management Program

The registration, transportation, and handling of materials classified as Hazardous Waste, is governed by Chapter D12 - *The Dangerous Goods Handling and Transportation Act*, which is administered by Manitoba Conservation. Relevant information is contained in:

- Compliance Guide to Manitoba's Hazardous Waste Legislation (October 1993)

ENVIRONMENTAL SITE INVESTIGATIONS

Appendix C
(cont'd.)

2.4 Petroleum Contaminated Soil Treatment/Disposal

Presently, Manitoba Conservation regulates the end use of petroleum contaminated soil, depending upon the nature and degree of severity of petroleum contamination. Information is provided in detail in:

- Guideline on Treatment and Disposal of Petroleum Contaminated Soil (April 2002)

2.5 Submission of Remedial Action Plans

Detailed written Remedial Action Plan proposals must be forwarded to Manitoba Conservation for review prior to the onset of any site remedial work. Information is provided in:

- Information Bulletin No. 96-02E Contaminated Sites in Manitoba Submission of Remedial Action Plans

2.6 CCME Guidelines and Codes of Practice

The Canadian Council of Ministers of the Environment (CCME) have generated a number of Guidelines and documents which can be used in dealing with sites in the Province of Manitoba, in association with provincial Guidelines, or where provincial Guidelines do not provide sufficient information for site specific issues. CCME documents commonly used in dealing with petroleum storage and contaminated sites include:

- Interim Canadian Environmental Quality Criteria for Contaminated Sites (September 1991)
- National Classification System for Contaminated Sites (Report CCME EPC-CS39E, March 1992)
- Subsurface Assessment Handbook for Contaminated Sites (Report CCME EPC-NCSRP-48E, March 1994)
- Guidance Manual for Developing Site-Specific Soil Quality Objectives for Contaminated Sites in Canada (July 1991)
- A Protocol for the Derivation of Ecological Effects-Based and Human Health-Based Soil Quality Criteria for Contaminated Sites (July 1994)
- Environmental Code of Practice for Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products (CCME EPC-LST-61E, March 1993)
- Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products (CCME-EPC-LST-71E, August 1994)
- Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites (December 1993)
- Subsurface Assessment Handbook for Contaminated Sites (March 1994)
- A Framework for Ecological Risk Assessment: General Guidance (March 1996) and Technical Appendices (1997)
- Canadian Soil Quality Guidelines (March 1997)
- Guidance Document on the Management of Contaminated Sites in Canada (CCME PN1279, April 1997)

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ENVIRONMENTAL SITE INVESTIGATIONS

- Canadian Environmental Quality Guidelines (1999)
- Canada Wide Standards for Petroleum Hydrocarbons in Soil (April 2001)

3.0 REPORTING AND APPROVALS

3.1 Submission of Reports/Plans to Manitoba Conservation

Submission of site investigation reports to the department is normally voluntary, however where the level of contamination exceeds the Environmental Quality Guidelines for the existing land use, it is recommended that the report be provided to Manitoba Conservation. In some cases submission of reports is required if the investigation was undertaken in order to comply with a remedial order or other regulatory provision administered by Manitoba Conservation.

Environmental site investigation reports that are submitted to Manitoba Conservation are reviewed by the department to determine the status of the site in reference to the Contaminated Site program.

1. Sites where contaminants were not detected are recorded in the department's database for future reference.
2. Sites where contaminants were found, but which are not designated as contaminated under CSRA, are considered to be impacted sites. The site is identified on the department's database and the status of the site is tracked. Tracking may include follow-up monitoring of site conditions or ascertaining any changes in site occupancy.
3. All relevant technical documentation relating sites designated as contaminated under the CSRA will be placed on the Manitoba Conservation Contaminated Sites Registry, which is made available for public viewing. Follow-up action is taken within the scope of the CSRA.

Copies of environmental investigation reports and related technical documentation submitted to Manitoba Conservation are kept on file at both the Winnipeg office of Manitoba Conservation and at the regional office responsible for the area where the site is situated. The addresses for Manitoba Conservation's offices are listed on page 16.

Remedial action plans for impacted or contaminated sites are required to be submitted to the department in order to assess the technical merit and suitability of the plan for successful site remediation, and compliance with existing regulations, health and safety issues. In addition, the scheduling for site remedial actions must be submitted to the department in order for Manitoba Conservation to provide on-site inspection of remedial activities, where deemed necessary.

Unless otherwise specified in a remedial order, all plans and reports should be directed, in duplicate, to the regional office of Manitoba Conservation in the region where the site is located. The addresses for Manitoba Conservation offices are provided on page 16.

3.2 Manitoba Conservation Approval

Upon completion of the review of an investigation report, Manitoba Conservation will, on request, provide a written response to the submitter. Typically the response will include comments on the investigation, a description of the department's position on the status of the site and an indication of what further action, if any, is required. Formal approval of a site investigation plan is not required unless specified as a condition of a remedial order. The department reserves the right not to provide written responses to reports on investigations which are not conducted in accordance with the principles described in this Guideline or for which insufficient data has been provided.

ENVIRONMENTAL SITE INVESTIGATIONS

Appendix C
(cont'd.)

The concurrence of Manitoba Conservation must be obtained before implementing a Remedial Action Plan at a site. Upon receipt of closure report demonstrating that the remedial work has been completed to the satisfaction of Manitoba Conservation, a certificate of compliance will be issued by the department for designated contaminated sites. For non-designated sites, a closure letter will be issued by the department confirming the completion of the remedial work.

4.0 SITE INVESTIGATION

4.1 Introduction

The purpose of this section is to provide a summary of acceptable investigation approaches and methodologies for conducting site investigations. The methodologies presented in the following discussion are intended mainly for the benefit of stakeholders responsible for ensuring the execution of an appropriate site investigation. Following the procedures will provide a suitable investigative approach for most environmental site investigations conducted in Manitoba.

Although one set of standard investigative methods cannot be developed to fully apply to all situations, the approach and methods described in this document are adequate to meet the requirements for the majority of site investigations. Due to the variability in investigative techniques, specific methodologies are not described in this document. It is assumed that qualified professionals will be engaged to conduct site investigations employing accepted industry practices that conform to procedures published by CCME or other recognized standard setting organizations. Any major variations to generally accepted methods are subject to review and acceptance by Manitoba Conservation, prior to implementation.

In all investigations, qualified professional environmental consultants should be retained in order to design the most effective investigation program for any given situation or site. It is also recommended that the site investigation be conducted by an experienced assessment team with an interdisciplinary scientific approach, in order to ensure an effective investigation/sampling plan, proper collection of representative samples, interpretation of results, and to achieve both the regulatory and scientific objectives outlined in this Guideline document.

Site investigations can be divided into two types: non-intrusive and intrusive investigations.

4.2 Non-Intrusive Environmental Site Investigations

In some cases, a non-intrusive investigation, often referred to as a Phase I Environmental Site Assessment (ESA), may be undertaken at a site to determine the existence or potential for site contamination. A Phase I ESA is not an Environmental Audit, which is intended to address regulatory compliance of facility operations but may include some or all components of an environmental audit.

Further information on non-intrusive site investigations is contained in:

CSA Z768-94	Phase I Environmental Site Assessment
ASTM E1527-97	Standard Practice for Environmental Site Assessment; Phase I Environmental Site Assessment Process

For the purpose of identifying sites which may have been affected by contaminants, a Phase I ESA should consist of the following, as a minimum:

- review of property history through the use of time-lapse aerial photographs, insurance maps, land title searches, regulatory agency records, previous ESA reports, company records, geological and hydrogeological reports/maps
- interviews with present and past site occupants, government officials (federal, provincial and municipal), neighbours, etc.

Appendix C
(cont'd.)

ENVIRONMENTAL SITE INVESTIGATIONS

- site visits to inspect site conditions, hazardous materials/dangerous goods storage and handling procedures, and to "ground-truth" assessments made in the historical review.

The results of the Phase I ESA should serve to identify areas of potential concern which could be verified during a subsequent detailed intrusive site investigation. The information gathered should be sufficient to identify and evaluate:

- the physical condition of the site and its geology, hydrogeology, facilities and surroundings, operational history, waste disposal practices, etc.
- potential key ecological receptors and pathways of exposure
- potential problem areas and contaminants of concern
- health and safety considerations
- areas requiring immediate or interim action
- a preliminary concept of scope of required site investigations
- adjacent land uses; and
- any proposed changes to the type of use of the subject site.

4.3 Intrusive Environmental Site Investigations

The objective of an intrusive investigation, also referred to as a subsurface investigation or Phase II ESA, is to characterize the contamination (degree, nature, estimated extent and media affected) and site conditions (geological, ecological, hydrogeological, and hydrological). Some of the activities conducted may include:

- sampling of potentially impacted media (soil, soil gas, groundwater, surface water); and
- analysis of potentially impacted media (field tests, lab analyses).

An intrusive investigation generally includes:

- a planning stage
- a field investigation program
- a monitoring program
- a laboratory analytical program
- an interpretation and evaluation stage
- report preparation

It is important that contingency provisions be incorporated into the investigation at each stage as additional site information becomes available.

Further information on intrusive site investigations is contained in:

CCME	Subsurface Assessment Handbook for Contaminated Sites (March 1994, EPC-NCSRP-48E)
ASTM	Standards Relating to Environmental Site Characterization (1997, PCN 03-418297-38)

4.3.1 Investigation Plan

The initial and perhaps most critical element of a contaminated site investigation is the investigation plan. The purpose of the plan is to ensure the collection of all data required to define the extent and relative degree of subsurface contamination. Site specific knowledge is required to design and execute an effective plan. A site reconnaissance is necessary to become familiar with the site and provide information required for plan development and implementation. Site specific factors can include:

- site history and adjacent land use
- site infrastructure

ENVIRONMENTAL SITE INVESTIGATIONS

Appendix C
(cont'd.)

- identity of any potential contaminants that have been stored or handled at the site, including the current and past location of storage and handling areas
- source, type, and estimated volume of any identified contaminant releases
- site geology, hydrogeology, and hydrology
- preferential contaminant migration pathways and proximity of receptors
- underground utilities and services locations
- presence of any environmentally sensitive areas

An investigation/sampling plan should describe the individual tasks and sampling effort, as well as when and how they will be performed. For the proper interpretation and evaluation of all data collected, the data must be generated by a scientifically effective and valid sampling program.

Key components of the investigation plan should include:

- field equipment requirements
- test hole location patterns for on-site and off-site investigations
- groundwater monitoring location, design, and construction
- soil/sediment sampling strategy and equipment
- groundwater monitoring and sampling strategy
- sample preservation and analytical considerations
- quality assurance and quality control program and data submission
- personnel and public health and safety requirements

Site specific knowledge of contaminant migration pathways, and the influence of geological, hydrological, physical-chemical and other factors, is often far from complete prior to initiation of field investigations. Subsurface assessments generally require a phased approach, regardless of the initially perceived size or scope of the investigation.

4.3.2 Field Investigation Methods

The number and placement of boreholes (test holes) or test pits, and monitoring wells required for an investigation will depend on the physical characteristics of the site and the nature of the potential contaminants. The initial phase of the investigation will concentrate on the areas where contaminants are most likely to be found in soil or groundwater. Typical areas would include fuel and/or chemical storage and handling sites, process tank areas and any areas with visible staining. The extent of the subsurface investigation will then be determined from the evaluation of the conditions encountered during drilling. Where contamination is encountered during a site investigation, the extent of the contaminant plume in soil and in groundwater must be delineated to the CCME Recommended Canadian Soil Quality Guidelines, Canadian Drinking Water Guidelines or Interim Criteria for the applicable land and water use category, unless otherwise agreed to by Manitoba Conservation.

Field investigation methods include:

- test hole drilling and soil/sediment sampling
- field screening/testing and measurements
- groundwater/soil vapour monitoring well installation
- groundwater monitoring and sampling
- field geophysical surveys

4.3.3 Laboratory Analysis

All laboratory analysis submitted to Manitoba Conservation as part of a site investigation report must be undertaken by facilities accredited by the Standard Council of Canada (SCC) or by another accrediting agency recognized by Manitoba Conservation to be equivalent to the SCC, or the analytical facility must be able to demonstrate that it has quality assurance/quality

Appendix C
(cont'd.)

ENVIRONMENTAL SITE INVESTIGATIONS

control (QA/QC) procedures in place equivalent to accreditation based on the Canadian Standard CAN/CSA - Z753, extension of the international standard ISO 9000, Guide 25. Recommended laboratory analytical methods for the analysis of soil, sediment, and groundwater should conform to those cited by U.S.E.P.A., CCME Subsurface Assessment Handbook or approved by Manitoba Conservation. The department may request confirmation on the accreditation of the analytical facility as well as certification of the individual methodology.

5.0 COMPARISON OF INVESTIGATION RESULTS TO GUIDELINES AND CRITERIA

After sufficient data has been compiled to determine the degree of contamination on the site, the next step is a decision making process based on the results of the field work. Initially the site is classified, using established criteria, as to the priority for further action. Then the investigation results are used to establish remediation target levels based on the risk to public health and safety and the physical environment.

5.1 Site Classification

Site classification is the process whereby the findings of the site investigations are used to establish the priority for remedial action at the site. This is generally a reiterative process which can be applied several times as data from the site investigation is refined.

Based on the information provided by the Site Assessment, the site should be classified as to the relative risk to human health and the environment. Site classification can be undertaken employing "The National Classification System for Contaminated Sites" (CCME, 1992) or by employing similar evaluative processes such as the "Risk-Based Corrective Action Applied at Petroleum Release Sites" (ASTM E 1739-95).

Site classification must be undertaken as part of the site investigation process.

5.2 Tier 1 Evaluation (Criteria Based)

Initially, contaminant concentrations found in the site investigation will be compared to published Environmental Quality Guidelines (EQG). For contaminants in soil, the default EQG will be the CCME Recommended Canadian Soil Quality Guidelines. EQG for surface and groundwater will be dependent on the potential usage of the water resource. In most cases either the Guidelines for freshwater aquatic life or the Canadian Drinking Water Standards will apply. This initial comparison will be used to determine the site classification and possible designation under the CSRA. Where a Tier 2 or Tier 3 evaluation is not conducted as outlined below, the EQG will also be the default remediation levels.

It should be noted that default EQG generally include very conservative risk estimates and the use of these criteria may result in decisions on remedial action which are more stringent than the actual site conditions require. Before a decision is made to use the EQG as the default remediation criteria, consideration should be given to site specific conditions and comparison of the pathways and receptors at the site to those used in the development of the EQG.

The use of alternative generic EQG for Tier 1 evaluation requires prior authorization by the department. Where specific EQG are not available, or detailed site specific information should be applied, or where human health and/or environmental risks cannot be effectively quantified, the Tier 2 or Tier 3 evaluation processes would be applied.

5.3 Tier 2 Evaluation (Site Specific Objectives)

The Tier 2 Evaluation essentially involves limited modifications to existing EQG for use as site specific remediation objectives. In cases where there are no specific remediation criteria

Guidelines available, other environmental quality criteria may be evaluated with respect to site specific conditions. In situations where site conditions, land use, receptors, or exposure pathways differ from those assumed in the protocol used to establish the EQG for various land use scenarios, the Tier 2 Evaluation can be employed.

Additional site assessment work is likely required for this evaluation. Both direct and indirect exposure scenarios would be addressed. Simplistic modelling based on descriptions of relevant physical/chemical phenomena would be applied. Modification to the EQG will be based on the measured and predicted attenuation of the contaminant(s) of concern. As in the case with Tier 1 Evaluation, an evaluation is made with respect to the sources, concentration and distribution of the contaminants, transport mechanisms, exposure pathways, and current and future land use, by applying the information from the Site Assessment and Site Classification, and the additional information obtained from the Tier 2 site assessment. It should be noted that only the Canadian Environmental Soil Quality Guidelines may be modified. The modified guidelines must consider both human health and environmental pathways and receptors, and be based on the most conservative estimate.

5.4 Tier 3 Evaluation (Risk Assessment)

The criteria-based approach may not be suitable for a site when pathways of exposure, contaminants, receptors, or other site characteristics vary significantly from those used to establish the EQG. Site Specific Remediation Objectives should be developed using risk assessment when:

- EQG are not available for the contaminants of concern and/or data needed to derive such Guidelines are not available
- site conditions, receptors, and/or exposure pathways differ significantly from those assumed in the derivation of Guidelines
- there are significant ecological concerns (e.g. critical or sensitive habitats for wildlife; rare, threatened or endangered species; parkland or ecological reserves; hunting or trapping resources); and
- there are unacceptable data gaps (e.g. contaminants for which little published information is available; unpredictable or uncertain exposure pathways or partitioning of a contaminant; uncertainty about hazard level or other pertinent information).

There are two basic types of risk assessment: Human Health Risk Assessment and Ecological Risk Assessment. One or both of these types of assessment may be required to be utilized for the development of Site Specific Remediation Objectives. The risk assessment would apply sophisticated statistical and contaminant fate and transport analysis, using site-specific input parameters for both direct and indirect exposure scenarios.

6.0 REPORT FORMAT

Site investigation reports that are forwarded to Manitoba Conservation for review should conform to the following format and provide the information specified below (as a minimum):

A) **Introduction**
- proponent's name and address
- investigator's name and address
- site legal description and municipal address

B) **Background**
- site occupants or business, relevant site history, previous investigations, and identified contaminant releases

C) **Site Description**
- subject site and surrounding land use

Appendix C
(cont'd.)

ENVIRONMENTAL SITE INVESTIGATIONS

- on-site and adjacent infrastructures
- applicable site and surrounding land use maps showing site location, infrastructures, and underground structures and services

D) **Field Investigations**
- rationale for investigation/sampling plan
- detailed procedures used for investigations conducted including QA/QC
- test hole, sample, and monitoring well location plan at an appropriate scale
- test hole logs and monitoring well completion drawings and details
- field screening/testing results
- site monitoring data (field measurements, vapour concentrations, depth to groundwater, product thickness, etc.)
- site topography
- principal groundwater flow direction
- visual evidence of surficial contamination
- contour plans of the site clearly illustrating contaminant concentrations in all phases and impacted media (i.e. soil/sediments, groundwater, surface water, dissolved phase, vapour phase, immiscible liquid phase). Diagrams will clearly indicate if "zero" contaminant closure is attained on-site or if off-site contamination is present/assumed.

E) **Laboratory Investigations**
- contaminant compound(s) identified
- analysis rational (i.e. number of samples and analytical parameters)
- soil/sediment and groundwater analytical results with supporting documentation
- laboratory QA/QC procedures and QC sample results

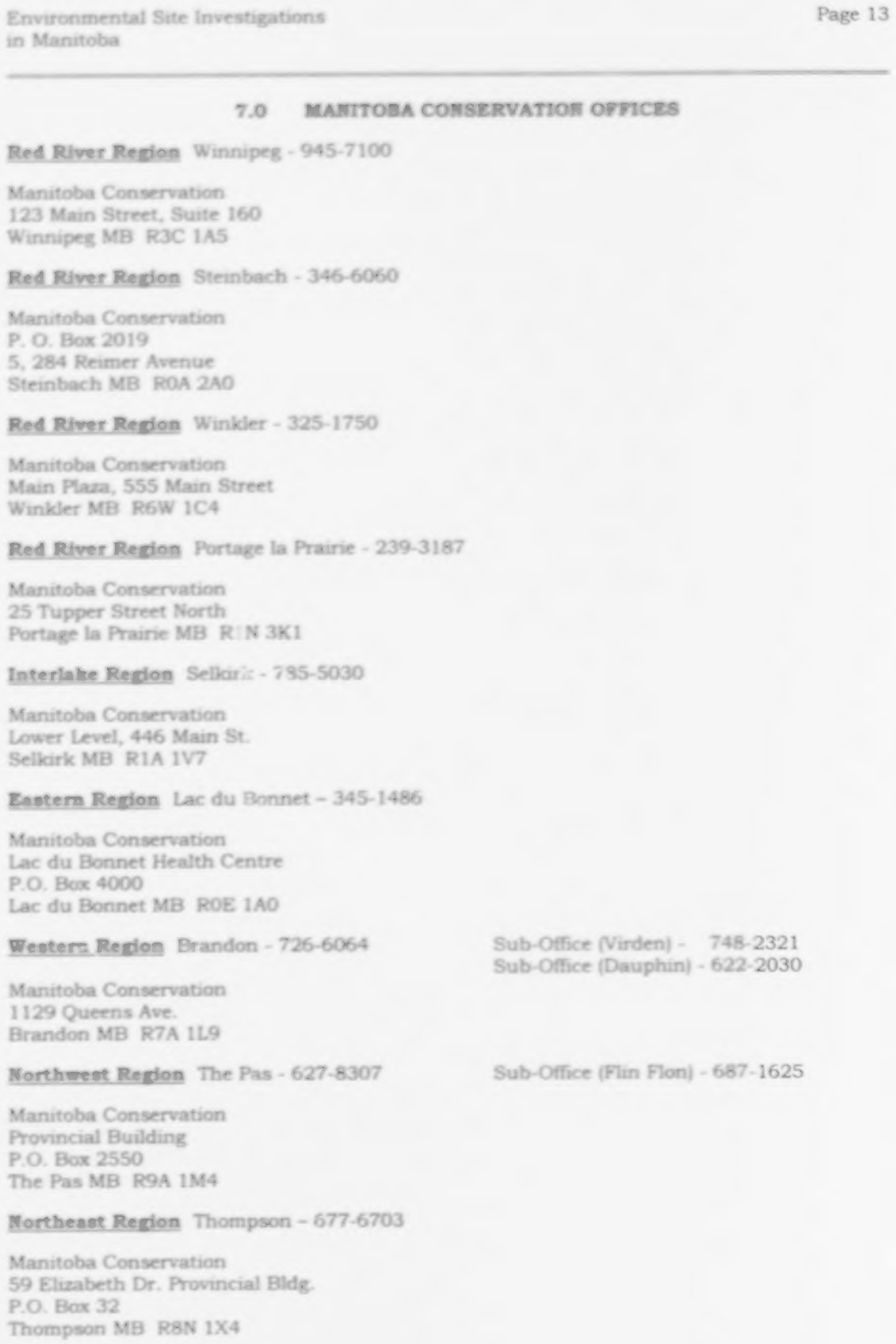
F) **Data Evaluation**
- site geological and hydrogeological conditions
- subsurface contaminant type(s) encountered
- field analytical and field monitoring data
- interpretation of laboratory analyses
- evaluation of impacted/contaminated media

G) **Site Investigation**
- site classification and conclusions
- extent and degree of severity of contamination identified
- contaminant(s) concentrations in relation to applicable regulatory criteria and/or risk-based derived criteria
- environmental conditions and health/safety concerns

H) **Conclusions and Recommendations**
- interpretation of site investigation
- immediate response requirements if required
- potential remedial action options/technologies if required
- additional investigative work, as required

ENVIRONMENTAL SITE INVESTIGATIONS

Appendix C
(cont'd.)



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Appendix D | GUIDELINE FOR DESIGNATION OF CONTAMINATED SITES

Guideline 97 - 01

GUIDELINE
FOR THE DESIGNATION
OF
CONTAMINATED SITES
IN MANITOBA

March 1997

Revised January 2004

Protecting & Managing our Future

Manitoba Conservation

GUIDELINE FOR DESIGNATION OF CONTAMINATED SITES

GUIDELINE FOR THE DESIGNATION OF CONTAMINATED SITES IN MANITOBA

1.0 INTRODUCTION

Historical practices, most of them environmentally unacceptable today, have created current conditions that could potentially harm human health and the environment. These activities include the improper use, handling, storage and disposal of materials containing chemicals with the potential to cause toxicity. In many cases, release of these chemicals into the environment has resulted in "unsafe" exposures to humans and the environment.

Manitoba's Contaminated Sites Remediation Act (CSRA) defines a site as contaminated if, "having regard to any current, permitted or foreseeable use of a site, that the site is contaminated at a level which poses or may pose a threat to human health or safety or to the environment". However, throughout North America, many sites with contamination that would not pose a threat to human health or safety, or to the environment have been remediated for economic reasons and land transaction purposes. Although remediation for these reasons is not discouraged by Manitoba Conservation, emphasis should be placed on sites that pose risks to human health and the environment. The CSRA embodies the risk-based principle to designate contaminated sites in Manitoba. This document has been developed to outline the evaluative process that applies risk-based protocol to designate contaminated sites in Manitoba.

1.1 Scope

This document is consistent with, and applies, the scientific protocols described in the "Guidance Document on the Management of Contaminated Sites in Canada" (Canadian Council of Ministers of the Environment [CCME]) and the "Risk-Based Corrective Action Applied to Petroleum Release Sites" (ASTM E 1739-95). Similar risk-based approaches are used in other Canadian and American jurisdictions for assessment and management of contaminated sites.

The Designation/Evaluation Process consists of a Site Assessment, Site Classification and a three tier Evaluation component to designate and manage contaminated sites in Manitoba (Figure 1). The first tier of the Evaluation component applies existing Environmental Quality Guidelines (EQG) in the determination of possible site Designation and appropriate remediation criteria. The second tier provides for the modification of EQG or other appropriate environmental quality criteria in the determination of site Designation and appropriate remediation criteria. The third tier provides for the application of a site specific risk assessment to establish appropriate EQG and determine the site Designation and appropriate remediation criteria. The selection and application of the appropriate site evaluation methodology, Tier 1, Tier 2 or Tier 3, is made by the responsible party(ies).

2.0 DESIGNATION/EVALUATION PROCESS

2.1 Site Assessment

The initial step in determining whether a site should be designated as a contaminated site is to conduct a site assessment. The first phase of this assessment may begin with the review of all available historical and current site information. This work includes the reviewing of all data gathered for legal, transactional or environmental reasons.

Appendix D
(cont'd.)

GUIDELINE FOR DESIGNATION OF CONTAMINATED SITES

The review can also include site inspections and discussions with personnel and local residents informed about the site and its history. The following three broad areas are covered in conducting the first phase of a site assessment:

- **Facility Characteristics**

  This includes a historical description of the site and its facilities, and past and present contaminant sources and discharge points. Visual inspection, reviewing of facility records and discussions with informed personnel are also employed.

- **Contaminant Characteristics**

  Contaminants that may be present on the site are identified and their quantities and concentrations are estimated.

- **Physical Site Characteristics**

  The geology, hydrology, hydrogeology, and geomorphology are examined using a number of sources to conduct a literature review of any available data about the site.

The information gathered should be sufficient to identify and evaluate the following:

- physical condition of the site, geology, hydrogeology, facilities and surroundings, operational history, waste disposal practices, etc.;
- potential key ecological receptors and pathways of exposure;
- potential problem areas and contaminants of concern;
- health and safety considerations;
- areas requiring immediate or interim action;
- preliminary concept of scope of required site investigations; and
- proposed future land use and adjacent land uses.

The second phase of the assessment is to characterize the contamination (degree, nature, estimated extent and media affected) and site conditions (geological, ecological, hydrogeological, and hydrological conditions) so an effective remedial plan can be developed (if necessary) or to identify the need for more detailed investigations. Further study may be necessary to determine risks to public health, safety or the environment. This may take the form of human health and ecological risk assessments using investigation data obtained in the site assessment step.

This phase of the assessment may include some or all of the following:

- field screening;
- sampling program;
- hydrogeological investigations;
- groundwater flow and contaminant transport models; and

GUIDELINE FOR DESIGNATION OF CONTAMINATED SITES

Appendix D
(cont'd.)

- bioassessment.

2.2 Site Classification

Based on the information provided by the Site Assessment, the site should be classified as to the relative risk to human health and the environment. Site classification can be undertaken employing "The National Classification System for Contaminated Sites" (CCME, 1992) or by employing similar evaluative processes such as the "Risk-Based Corrective Action Applied at Petroleum Release Sites" (ASTM E 1739-95).

2.3 Tier 1 Evaluation (Criteria Based)

Applying the information from the Site Assessment and Site Classification, an evaluation is made with respect to the sources, concentrations and distribution of contaminants, transport mechanisms, exposure pathways, receptors, and current and future land use. Where contaminant concentrations exceed the existing EQG, and potential risk to human health and/or the environment, the site will be designated as a contaminated site. Designation requires both exceeding the EQG and identification of potential risk to human health and/or the environment. Although the EQG provide the default basis for designation and remediation levels for the site, particular consideration is given to site specific conditions and comparison of the pathways and receptors at the site, to those used in the development of the EQG. It should also be noted that these guidelines provide a conservative estimation of risk, designed to capture the maximum number of sites for evaluation.

Where a site is designated as a contaminated site under this evaluation process, development of a Remedial Action Plan would be based on achieving the EQG criteria. Where specific EQG are not available, or detailed site specific information should be applied, or where human health and/or environmental risks cannot be effectively quantified, the Tier 2 or Tier 3 Evaluation processes would be applied.

2.4 Tier 2 Evaluation (Site Specific Objectives)

The Tier 2 Evaluation essentially involves limited modifications to existing EQG for use as site specific remediation objectives. In cases where there are no specific remediation criteria guidelines available, other environmental quality criteria may be evaluated with respect to site specific conditions. In situations where site conditions, land use, receptors, or exposure pathways differ from those assumed in the protocol used to establish the EQG for various land use scenarios, the Tier 2 Evaluation can be employed.

Additional site assessment work is likely required for this evaluation. Both direct and indirect exposure scenarios would be addressed. Simplistic modeling based on descriptions of relevant physical/chemical phenomena would be applied. Modification to the EQG will be based on the measured and predicted attenuation of the contaminant(s) of concern. As in the case with Tier 1 Evaluation, an evaluation is made with respect to the sources, concentration and distribution of the contaminants, transport mechanisms, exposure pathways, and current and future land use by applying the information from the Site Assessment and Site Classification and the additional information obtained from the Tier 2 site assessment.

Where contaminant concentrations exceed the modified EQG and potential risks to human health and/or the environment, the site will be designated as a contaminated site. Development of a Remedial Action Plan would be based on achieving the modified EQG. Where appropriate environmental quality criteria are not available, site specific characteristics vary considerably from the criteria approach (EQG), and/or human and environmental health risks are cannot be adequately assessed, the Tier 3 evaluation process would be applied.

2.5 Tier 3 Evaluation (Risk Assessment)

GUIDELINE FOR DESIGNATION OF CONTAMINATED SITES

The criteria-based approach may not be suitable for a site when pathways of exposure, contaminants, receptors, or other site characteristics vary significantly than those used to establish the EQG. Site Specific Remediation Objectives should be developed using risk assessment when:

- EQG are not available for the contaminants of concern and/or data needed to derive such guidelines are not available;
- site conditions, receptors, and/or exposure pathways differ significantly from those assumed in the derivation of guidelines;
- there are significant ecological concerns (e.g. critical or sensitive habitats for wildlife; rare, threatened or endangered species; parkland or ecological reserves; hunting or trapping resources); and
- there are unacceptable data gaps (e.g. contaminants for which little published information is available; unpredictable or uncertain exposure pathways or partitioning of a contaminant; uncertainty about hazard level or other pertinent information).

There are two basic types of risk assessment: Human Health Risk Assessment and Ecological Risk Assessment. One or both of these types of assessment may be required to be utilized for the development of Site Specific Remediation Objectives. The risk assessment would apply sophisticated statistical and contaminant fate and transport analysis, using site-specific input parameters for both direct and indirect exposure scenarios.

Where contaminant concentrations exceed the Site Specific Remediation Objectives determined by the risk assessment, and potential risk to human health and/or the environment, the site will be designated as a contaminated site. Development of a Remedial Action Plan would be based on achieving the Site Specific Remediation Objectives established by the risk assessment.

3.0 REMEDIAL ACTION PLAN

When site remediation is determined to be appropriate to minimize or eliminate the hazards associated with both designated contaminated sites and sites where contamination exists, or where the director issues a remediation order, a Remedial Action Plan proposal is to be forwarded to Manitoba Conservation pursuant to Information Bulletin No. 96-02E.

4.0 TRACKING

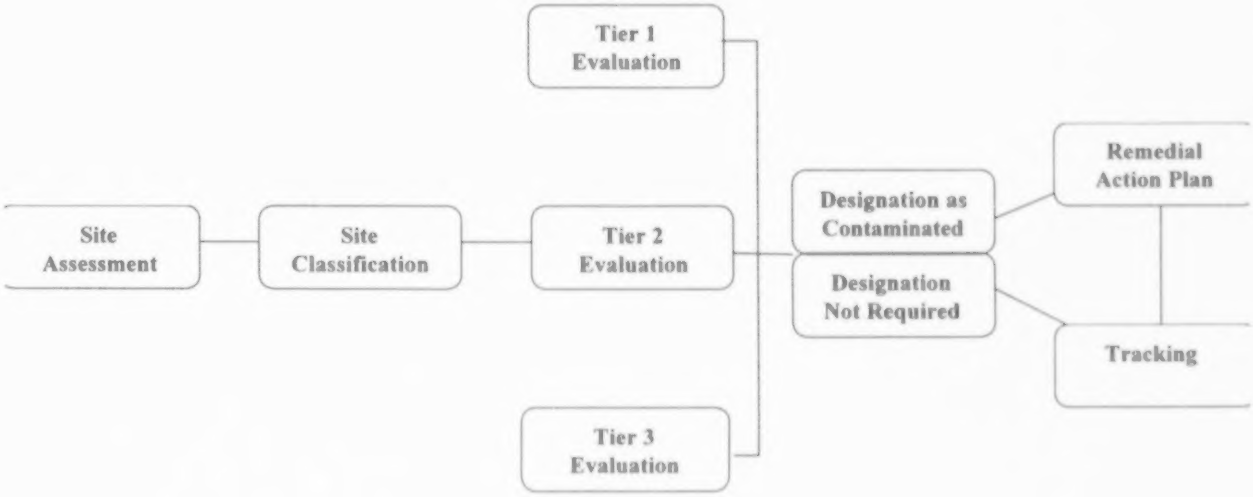
Sites that are impacted with contaminants that exceed the lowest established EQG criteria, but are determined through the Designation/Evaluation Process not to be designated contaminated sites, will continue to be tracked by Manitoba Conservation. These sites will be entered on the Manitoba Sites Database and tracked to ensure that in the event that residual contamination results in some form of exposure concern in the future, the sites will be re-evaluated for possible designation and remediation.

GUIDELINE FOR DESIGNATION OF CONTAMINATED SITES

Appendix D
(cont'd.)

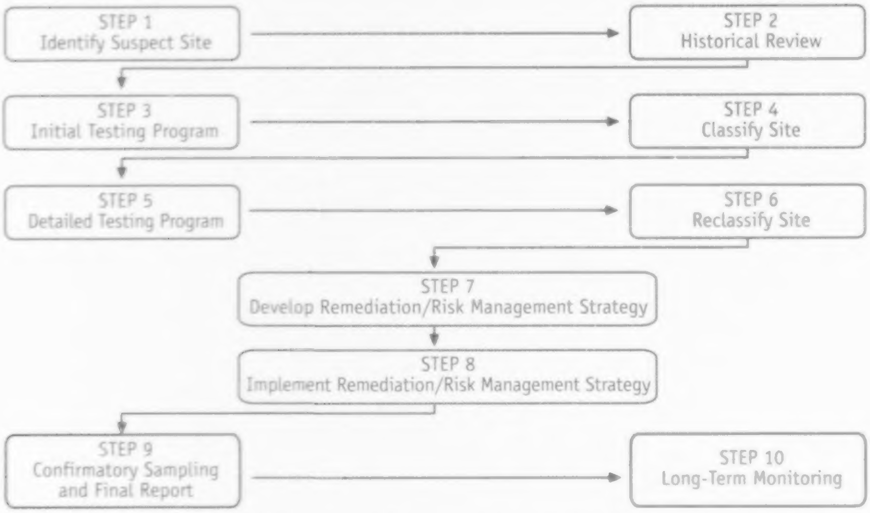
FIGURE 1

**GUIDELINE
FOR THE DESIGNATION OF
CONTAMINATED SITES IN MANITOBA**


Site Assessment
Site Classification
Tier 1 Evaluation
Tier 2 Evaluation
Tier 3 Evaluation
Designation as Contaminated
Designation Not Required
Remedial Action Plan
Tracking

Appendix E | CCME GUIDELINES FOR CONTAMINATED SITES

Steps for Addressing a Contaminated Site


STEP 1
Identify Suspect Site
STEP 2
Historical Review
STEP 3
Initial Testing Program
STEP 4
Classify Site
STEP 5
Detailed Testing Program
STEP 6
Reclassify Site
STEP 7
Develop Remediation/Risk Management Strategy
STEP 8
Implement Remediation/Risk Management Strategy
STEP 9
Confirmatory Sampling and Final Report
STEP 10
Long-Term Monitoring

NOTE: The steps shown above illustrate the complete process involved in identifying, verifying and remediating contaminated sites. There will be instances where some of the steps may not be required.

Step 1 - **Identify Suspect Sites:** Identifies potentially contaminated sites based on activities (past or current) on or near the site.

Step 2 - **Historical Review:** Assembles and reviews all historical information pertaining to the site.

Step 3 - **Initial Testing Program:** Provides a preliminary characterization of contamination and site conditions.

Step 4 - **Classify Contaminated Site Using the CCME National Classification System:** Prioritizes the site for future investigations and/or remediation/risk management actions.

Step 5 - **Detailed Testing Program:** Focuses on specific areas of concern identified in Step 3 and provides further in-depth investigations and analysis.

Step 6 - **Reclassify the Site Using the CCME National Classification System:** Updates the ranking based on the results of the detailed investigations.

Step 7 - **Develop Remediation/Risk Management Strategy:** Develops a site-specific plan to address contamination issues.

Step 8 - **Implement Remediation/Risk Management Strategy:** Implements the site-specific plan that addresses contamination issues.

Step 9 - **Confirmatory Sampling and Final Reporting:** Verifies and documents the success of the remediation/risk management strategy.

Step 10 - **Long-Term Monitoring:** If required, ensures remediation and long-term risk management goals are achieved.

Source: Government of Canada, 1999. Contaminated Sites Management Working Group. A Federal Approach to Contaminated Sites, p.7.

GUIDE TO THE CONTAMINATED SITES REMEDIATION ACT
S.M. 1996, c.40

Appendix F

Updated July 15, 2002

Manitoba
Conservation

Guide to The Contaminated Sites Remediation Act
S.M. 1996, c. 40

1. BACKGROUND
2. THE ACT: KEY PROVISIONS
3. APPEALS
4. OFFENCES AND PENALTIES
5. COST RECOVERY
6. ROLE OF MANITOBA CONSERVATION

1. BACKGROUND

Contaminated sites have become both a national and provincial concern. Improper use, handling, storage and disposal of materials containing chemicals have led to the release of contaminants into the environment. In many cases, this has resulted in impacts to the environment, and in some instances, unsafe exposures to human health. To prevent or minimize the risk to human health or the environment, or to restore these sites to useful purposes, requires management, which sometimes includes remediation.

The Contaminated Sites Remediation Act (The Act), and its accompanying regulation, have been enacted to provide regulatory authority to designate and manage sites that have been exposed to environmental contaminants. They also address issues of liability and remediation of these sites. Contaminated sites liability principles agreed to by the Canadian Council of Ministers of the Environment, have been incorporated into the Act. The key principles that The Act is based upon are: polluter pays; fairness; and openness, accessibility and public participation in site remediation.

This Guide will provide you with a quick overview of The Act. Key provisions of The Act are explained, as well as the roles of Manitoba Conservation and the Clean Environment

Appendix F
(cont'd.)

GUIDE TO THE CONTAMINATED SITES REMEDIATION ACT
S.M. 1996, c.40

Updated July 15, 2002

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Commission. Please keep in mind this Guide is a description of the legislation and should not be used as a substitute for reading the legislation.

Copies of The Contaminated Sites Remediation Act, and The Contaminated Sites Remediation Regulation, can be purchased from the Government of Manitoba's Statutory Publications Branch. The Act can also be accessed on the Manitoba Government Statutory Publications site at http://web2.gov.mb.ca/laws/statutes/ccsm/c205e.php.

2. THE ACT: KEY PROVISIONS

The principal purpose of The Contaminated Sites Remediation Act (CSRA) is to reduce the risks to human health and the environment. Secondly, The Act provides for the remediation of contaminated sites and where practicable, restoring them to a useful purpose. Thirdly, The Act sets out a process to fairly apportion costs associated with site remediation between the parties responsible for the contamination.

The Act sets out a four-step process for dealing with contaminated sites.

i) Investigation and Identification of a Site

If the Director believes that a site may be contaminated, they may order a site investigation to be done, by either the owner or the occupier of the property. Site investigations determine if contamination exists, and if so, the nature and extent of the contamination.

In order for the contamination to pose a health risk or environmental threat, the contaminants on a site must have contact with people or sensitive plants and animals in the environment. This is known as a "pathway". Examples of common pathways for contaminants are ingestion (through drinking water), inhalation (breathing vapours or dust) and dermal contact (through the skin). If no pathway exists for the contaminants to contact people, that is the contamination cannot be ingested, inhaled or touched, there is no immediate risk to human health. The same is true if the contamination has no pathway to receptors in the environment. These pathways are taken into consideration when investigating a site.

(ii) Designation/Non-Designation of a Contaminated Site

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Following investigation, if the property has been impacted by contaminants but proves not to pose a threat to human health, safety or the environment, the property will not be designated a contaminated site. However it will continue to be monitored by Manitoba Conservation.

If a threat to human health, safety or the environment may or does exist, the site will be designated by the Director as a contaminated site. Notice of a contaminated site designation is then sent to the Land Titles Office, the registered owner(s) of the site, persons with a registered interest (e.g. a mortgage) in the site, the municipality within which the site is located, and the site registry administered by Manitoba Conservation.

iii) Site Remediation

Once a site has been designated as contaminated, a remedial action plan must be submitted to the Director by the party(ies) responsible for the contamination. The Director may, depending on the circumstances, choose to seek public consultation on the plan. Based upon the results of these consultations a remediation order will be issued by the Director.

Once remediation has been satisfactorily completed, a revocation of designation as a contaminated site will be issued to the Land Titles Office, the registered owner(s), the municipality and the site registry. A Certificate of Compliance may be issued at the request of a responsible party.

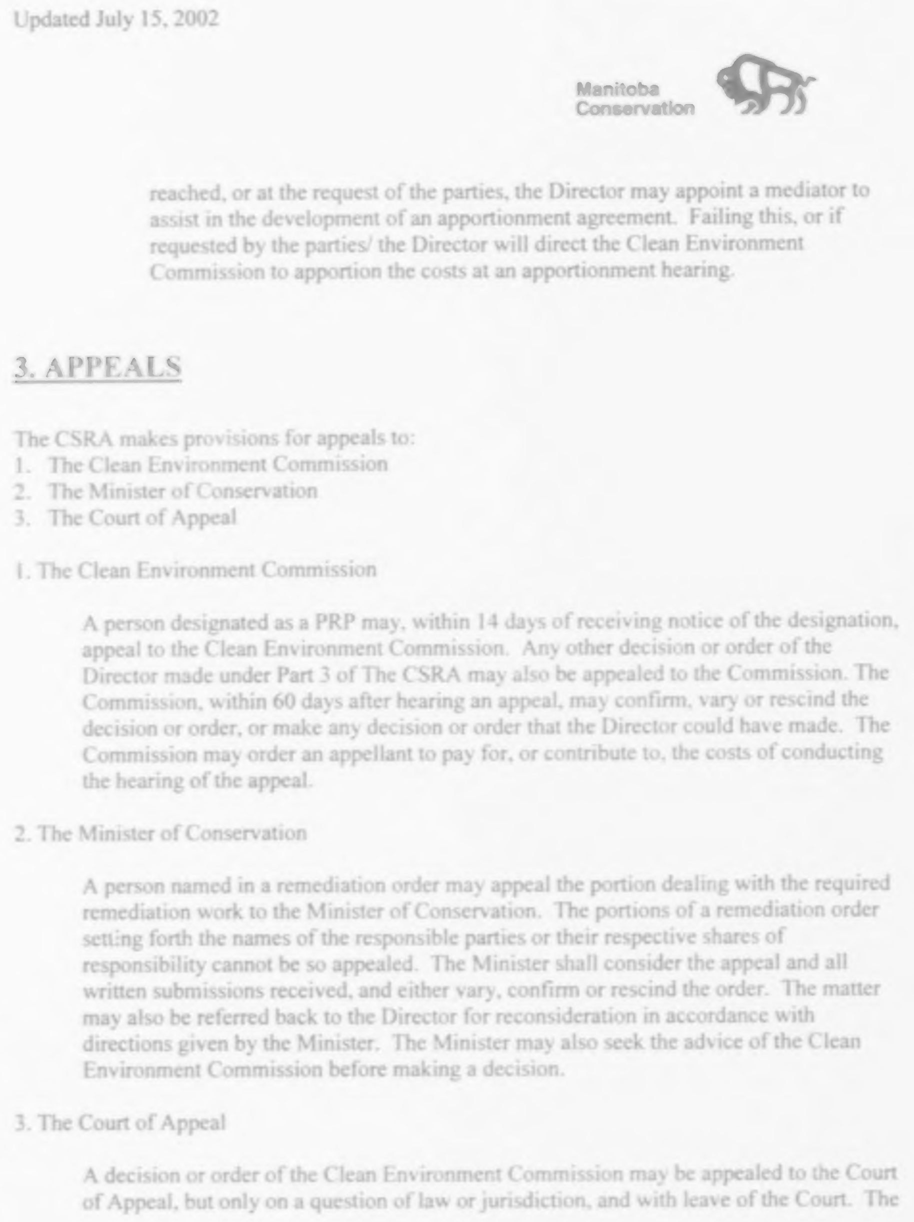
iv) Apportionment of Responsibility for Remediation

The CSRA applies the 'polluter pays' principle whereby the person(s) who caused the contamination of a site is responsible for its remediation. If, in the Director's opinion, two or more persons should be held responsible for the remediation of a contaminated site, the Director will, by written order, designate them as being potentially responsible persons (PRP). Any person designated as a PRP has 14 days after being notified to request in writing a revocation of the designation based on an exemption under the Act, or to nominate additional names to the group of potentially responsible persons.

The Act provides that PRPs are to be given a specified length of time to agree upon the apportionment of costs for remediation of the site and submit the agreement to the Director for approval. If no voluntary agreement can be

Appendix F
(cont'd.)

GUIDE TO THE CONTAMINATED SITES REMEDIATION ACT
S.M. 1996, c.40



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reached, or at the request of the parties, the Director may appoint a mediator to assist in the development of an apportionment agreement. Failing this, or if requested by the parties/ the Director will direct the Clean Environment Commission to apportion the costs at an apportionment hearing.

3. APPEALS

The CSRA makes provisions for appeals to:
1. The Clean Environment Commission
2. The Minister of Conservation
3. The Court of Appeal

1. The Clean Environment Commission

A person designated as a PRP may, within 14 days of receiving notice of the designation, appeal to the Clean Environment Commission. Any other decision or order of the Director made under Part 3 of The CSRA may also be appealed to the Commission. The Commission, within 60 days after hearing an appeal, may confirm, vary or rescind the decision or order, or make any decision or order that the Director could have made. The Commission may order an appellant to pay for, or contribute to, the costs of conducting the hearing of the appeal.

2. The Minister of Conservation

A person named in a remediation order may appeal the portion dealing with the required remediation work to the Minister of Conservation. The portions of a remediation order setting forth the names of the responsible parties or their respective shares of responsibility cannot be so appealed. The Minister shall consider the appeal and all written submissions received, and either vary, confirm or rescind the order. The matter may also be referred back to the Director for reconsideration in accordance with directions given by the Minister. The Minister may also seek the advice of the Clean Environment Commission before making a decision.

3. The Court of Appeal

A decision or order of the Clean Environment Commission may be appealed to the Court of Appeal, but only on a question of law or jurisdiction, and with leave of the Court. The

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Court of Appeal, on hearing an appeal, may refer the matter back to the Commission for a rehearing or further consideration respecting the issue on appeal, or quash, vary or confirm the decision or order appealed.

4. OFFENCES AND PENALTIES

An individual who is guilty of an offence under The Act can be fined up to $50,000 or imprisoned for a term of not more than six months, or both, for a first offence. For each subsequent offence, an individual is liable to be fined an amount of up to $100,000 or imprisoned for a term of not more than one year, or both.

A Corporation that is guilty of a first offence can be fined up to $500,000. For each subsequent offence, the fine can range up to $1,000,000.

5. COST RECOVERY

If a party responsible for a site investigation or for the remediation of a contaminated site fails to comply with an order or an agreement, the Director may order the work to be done. The costs incurred become a debt due to the government by the responsible party.

6. ROLE OF MANITOBA CONSERVATION

1. Identification of Contaminated Sites

   Manitoba Conservation identifies sites that are or may be contaminated, through a number of regulatory mechanisms and places them on the Manitoba Sites Database. This database categorizes the sites, using codes to identify the status of a site. These sites are monitored by Environment Officers from site evaluation through to the remediation of the site.

2. Site Registry

   Manitoba Conservation maintains and provides access to a contaminated sites registry which provides information on all sites designated as a "contaminated site" under The CSRA.

Appendix F
(cont'd.)

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Locations of these registries can be obtained by calling Manitoba Conservation or from Manitoba Conservation's Home Page on the Internet (http://www.gov.mb.ca).

3. Inspections & Investigations

Environment Officers from Manitoba Conservation are empowered under The Act to conduct inspections or investigate sites that are, or are suspected to be contaminated. If required, an Environment Officer may have access to any land or building, vehicle or other place in order to make inspections and determine compliance with The Act.

4. Education and Information

Manitoba Conservation will provide, upon request, material related to contaminated sites and will periodically distribute Information Bulletins. Staff will also, as resources allow, participate in training programs on various technical, legal or procedural aspects of site contamination.

THE PROTECTION OF WELL WATER QUALITY IN MANITOBA

For most Canadians, our image of Canada is, I suspect, a land of sparkling lakes, rivers and streams. Yet under the surface, is a largely invisible reservoir of groundwater that exists almost everywhere. Because it is less visible, concerns about water quality are usually focused on what we can see – the surface waters of lakes, rivers and streams.

In Manitoba approximately 25% of the population relies on groundwater for drinking water with most of our rural population relying on groundwater from privately owned well systems. While such well owners are responsible for their own well, the underground aquifer is a resource for the benefit of all citizens which must be protected. It is with this in mind that we chose to conduct this audit.

Our examination of the Province's risk management efforts regarding private wells indicates that there is much work to be done to ensure that groundwater is adequately protected for the benefit of future generations.

This report contains forty-one recommendations which identify opportunities for improvement in the areas of:

- **effective communication;**
- **well-developed and implemented standards and legislation; and**
- **active monitoring for compliance with standards and legislation.**

Close to ten million Canadians rely on groundwater for their drinking supply. Even when we might not use it directly as drinking water, all Canadians rely indirectly on groundwater because it is the primary source of water for livestock watering and crop irrigation. As groundwater is an integral component of the hydrologic cycle, the health of our streams, lakes, wetlands, and associated ecosystems depend upon it. Groundwater also sustains economic activity providing significant water supplies for industries involved in manufacturing, mining and petroleum and, in particular in Manitoba for agricultural purposes, for crop irrigation and livestock watering.

The events of Walkerton, Ontario and North Battleford, Saskatchewan immediately come to mind when we think of water contamination. However, we are not immune to water contamination events in Manitoba. A number of communities in Manitoba have experienced water problems, and some continue to experience problems. Examples include: solvent contamination of the groundwater in the Rural Municipality of Rockwood which was discovered in 1991 and for which remediation efforts continue today, gasoline contamination in the community of Cypress River, and bacterial contamination in Tyndall, Garson, Ninette, and Iles des Chenes. As at March 31, 2005, there were 40 boil water advisories in place in communities throughout Manitoba, including the aforementioned.

The Province has recently taken positive steps to improve risk management efforts regarding private wells, but I encourage a continued focus in this regard as recommended in this report.

Jon W. Singleton, CA•CISA

Executive Summary

GROUNDWATER STEWARDSHIP

Water is essential for all living things and is an important component of countless human activities. Manitoba has an extensive reserve of freshwater in its many lakes, rivers and streams. Under the surface is a largely invisible reservoir of groundwater that exists almost everywhere.

Groundwater is a key component of the hydrologic cycle, and as such is integral to the health of our streams, lakes, wetlands, and associated ecosystems. Groundwater also sustains economic activity providing significant water supplies for industries involved in manufacturing, mining and petroleum and for agricultural purposes such as crop irrigation and livestock watering.

REASON FOR THE AUDIT

In Manitoba, approximately 25% of the population relies on groundwater for drinking water. Most of the rural population relies on groundwater from privately owned well systems. While such well owners are responsible for their own well, the underground aquifer is a resource for the benefit of all citizens and must be protected. It is with this in mind that we chose to conduct this audit.

OBJECTIVES, SCOPE AND APPROACH

Our audit focused on the risk management efforts of the Province regarding private (i.e., single household/domestic) water wells that supply drinking water for human consumption and answered the following questions:

- Does the Province have appropriate drinking water quality standards in place to protect public health? (**Section 3.0**)
- Did the Province use the information it has gathered on private well water quality to adequately inform the public of private well water issues? (**Section 4.0**)
- Is the Bacteriological Water Testing Subsidy Program managing for results? (**Section 5.0**)
- Is the Province responding quickly and appropriately to bacterial well water contamination? (**Section 6.0**)
- Is the Province appropriately managing the licensing of well drillers? (**Section 7.0**)
- Is the Province ensuring that well drillers and well owners are complying with appropriate water well standards? (**Section 8.0**) and,
- Is the Province ensuring that drillers are obtaining permits prior to drilling in the Rockwood Sensitive Area? (**Section 9.0**)

Our work focused on activities conducted primarily during the period January 1, 2002 through March 31, 2003. Portions of our examination necessitated examination of records dating back to 2000 regarding water contamination events, and back to 2001 regarding the well database and well driller's reports.

Our audit was substantially conducted from September 2002 through June 2003.

On November 20, 2003, subsequent to the completion of our fieldwork, the Government created the Department of Water Stewardship (Department). As a result, the Office of Drinking Water and the Water Branch of the Department of Conservation were transferred to this new department.

During December 2002, we conducted a random telephone survey of 400 rural, private well owners in Manitoba. Survey questions were designed to address many of our audit criteria.

We did not audit the Province's risk management efforts regarding wells used for industrial purposes, irrigation or agricultural purposes such as livestock watering.

MAIN POINTS

Our detailed report outlines our findings and conclusions for each of the previously noted questions. Separate report sections address each question. Our findings can be captured under one of three overarching themes:

1. Inadequate public communication;
2. Under-developed standards and legislation; and
3. Limited review and monitoring practices.

INADEQUATE PUBLIC COMMUNICATION

Disseminating information is a vital component of any provincial initiative aimed at protecting water quality. Citizens need to understand where and what kind of contamination is occurring, what is expected of them, what they can do, and what the Province is doing.

Section 4.1

Little effort was made by the Province to ensure that the public was appropriately informed that a number of provincial initiatives found occurrences of excessive levels of various contaminants in provincial groundwater, where it was occurring, and why it occurred. Water testing results gathered from the Bacteriological Water Testing Subsidy Program offered by the Province since May 2001 have consistently shown coliform and E.coli bacteria above the levels considered safe under Health Canada's *Guidelines for Canadian Drinking Water Quality*. Our survey of 400 well owners indicated that many still had high trust that their groundwater was good, and as a result, did not see the need to test the water from their wells. There is no provincial program in place for nitrate testing.

Section 4.2

In 2000, the Drinking Water Advisory Committee, chaired by the Chief Medical Officer of Health issued their report and recommendations. This report is available on the Province's website, but there is no update of the implementation status of the recommendations. Given the importance of the Committee's recommendations, the Province has a responsibility to report back to the public on its actions in response to these recommendations. As an example, to date there is no legislated testing requirement for semi-public water systems.

Section 4.3

The Province has developed many Fact Sheets to assist well owners, but has not ensured this information is readily accessible.

Section 5.2

Uptake of the Bacteriological Water Testing Subsidy Program is well below expectations. A likely contributing factor is the lack of effective communication regarding the program's existence. Of the 400 well owners we surveyed only 14% were aware of the program. The low uptake of the Bacteriological Water Testing Subsidy Program lends further support to the concern that well owners have not been sufficiently informed of the known risks to the groundwater supply.

Section 5.4

With respect to the Bacteriological Water Testing Subsidy Program, one of the three contracted labs exceeded the 5 day turnaround requirement for communicating test results to well owners in 36 of the 100 water tests in our sample.

Section 6.3

Timely communication of known instances of contamination is critical. The investigation requirements of a contamination event may delay the issuance of a boil water advisory well beyond 7 days after initial awareness. A cautionary announcement practice is not in place to advise well owners of the ongoing provincial investigation.

UNDER-DEVELOPED STANDARDS AND LEGISLATION

We noted numerous instances where better guidance was needed. Either standards were not in place, legislative provisions were lacking, or internal policies and procedures were missing.

Sections 3.1/3.2

Manitoba water quality standards are only in draft format as per the latest November 22, 2002 draft document. Pending finalization of water quality standards in a provincial regulation, the Office of Drinking Water is applying the *Guidelines for Canadian Drinking Water Quality* published by the federal government.

The Drinking Water Safety Act was passed on August 9, 2002 and was proclaimed in part in January 2004, with the exception of Section 3 of this Act. The majority of this section relates to the requirement that, *"Every public water supplier and semi-public water supplier must comply with drinking water quality standards specified in the regulations"*. Section 3 and the referenced Regulations were excluded because the

Manitoba water quality standards have not yet been finalized. Certain parts of the unproclaimed provisions such as 21(2), 22(1), 22(4) and 24, also relate specifically to private water system sampling, analysis and reporting.

Further, Section 2 of The Water Protection Act states, *"The Lieutenant Governor in Council may make regulations setting or adopting water quality standards, objectives or guidelines"*. This Act has not yet been proclaimed, at which time it will be in force.

Although the unproclaimed legislation mainly apply to public and semi-public systems for purposes of enforcement of water quality standards, finalizing and publishing standards supported by legislation will assist private well water owners to understand what water quality parameters they should be expecting from their own water so that it is safe to consume.

Section 4.2

There is no legislative testing requirement for semi-public water systems even though this was a recommendation of the Drinking Water Advisory Committee in 2000.

Section 5.1

The Department had not developed an operating manual for the Bacteriological Water Testing Subsidy Program. Such a manual could provide a documented framework for operating the program and include such topics as program eligibility, program performance, contract management, staff roles and responsibilities, data collection and analysis, and reporting.

Sections 6.1/6.2/6.3

Responsibility and action protocols help ensure all stakeholders involved in reacting to a contamination event act in a coordinated and complementary manner. While Department officials had recognized the need for such protocols, protocols had not yet been developed.

Section 7.1

Licensing by a government organization should provide the consumer with assurance as to the abilities of the licensed individual to properly conduct the work they were hired to do. Being granted a well drilling license in Manitoba does not mean that you have demonstrated competence in well drilling. The current framework gives the consumer and the public at large very little assurance in this regard. Well driller licensing criteria are not designed to assess the competency of well drillers. In addition, we noted that licensing criteria are not entrenched in legislation.

Section 8.1

Detailed water well construction, maintenance and abandonment standards are not in place, nor entrenched in legislation. Manitoba lags well behind many other provinces in this regard.

Sections 8.5/8.6

Improperly constructed or closed wells present a hazard to water supplies. Existing legislation does not require that well owners report the drilling of wells on their property when using personal equipment, or the reporting of wells that they have abandoned or closed.

LIMITED REVIEW AND MONITORING PRACTICES

Whenever government services are provided by a third party or whenever a critical activity, such as well drilling, is subject to regulatory requirements or obligations, an appropriately designed monitoring program should be in place to ensure services are being delivered as expected, and that there is compliance with regulatory provisions. Accountability by third parties must be actively pursued. The province has a responsibility to the public to ensure that it obtains and acts upon the information required to hold third parties accountable. In this audit, accountability relationships existed between the province and:

- Laboratories conducting water tests under the Bacteriological Water Testing Subsidy Program; and
- Well drillers in applying for licenses and in reporting wells drilled.

We observed a number of instances where the Province failed to obtain required information or failed to review or act on available information.

Section 5.4

We noted that officials responsible for the Bacteriological Water Testing Subsidy Program were not monitoring laboratory compliance to contract and reporting requirements. We observed that while labs were diligent in submitting their weekly reports, the majority of the reported test results did not include the legal property descriptions. This is necessary to pinpoint the location of the well, and to enable pattern surveillance, a significant objective of the program.

Section 5.5

A water test database is not in place even though the technological capacity has existed within the Department for a number of years. The ability to link test results to geographic locations is critical for effective pattern surveillance and early detection of potential contamination.

Section 7.2

The well driller licensing process is little more than a paper handling and license fee collection activity. Well drilling licenses were issued even though license applications excluded required information, and even though the Department did not follow-up on the information that was provided, such as reference names for the last three wells drilled.

Section 7.3

The license renewal process only begins after licenses have expired. As a result many wells are drilled in the first three months of the year by unlicensed well drillers.

Section 7.4

While officials state that complaints against well drillers are considered when assessing license applications, the Department does not formally document and track complaints or enquiries.

Section 8.2

Similar to the receipt of well driller license applications, the Department accepted incomplete well driller's reports, and with the exception of pursuing legal property descriptions, did not ensure the required information was subsequently provided.

Section 8.3

The Department did not ensure drillers submitted their reports within the 5 day timeframe required by regulation. As a result, well information was not input to the well database in a timely fashion. Timely update is important because the well database is a useful resource to many stakeholders.

Section 8.4

Detailed scrutiny of well driller's reports is a cost effective approach to obtaining information on well driller competence and the quality of the well drilled. The Department did not review the reports to detect inappropriate or inadequate construction practices. We provide an example of how pumping test information can be assessed and used.

Section 8.7

A comprehensive well inspection program is not in place, and well inspections are only being conducted as part of an investigation of a contamination event. Given the risks involved in locating, drilling, maintaining and closing wells, there is a definite need for a proactive, risk based inspection program. Our survey results indicate that many wells may not be well constructed or located. Such wells are particularly vulnerable to contamination.

Section 9.0

Of particular concern is that the driller reporting process did not result in the Department detecting that wells were being drilled in the Rockwood Sensitive Area without the required permits. Permits to drill in this area are required by the Rockwood Sensitive Area Regulation that was issued in 1994. We determined that at least 47 wells were drilled in the last eight years without the required permits.

RECOMMENDATIONS

Our report includes 41 recommendations as well as the Department's response to the report. These recommendations are in **Section 10.0.**

1.0 Introduction

1.1 REASON FOR THE AUDIT

Water is essential for all living things and is an important component of countless human activities. Manitoba has an extensive reserve of freshwater in its many lakes, rivers and streams. Under the surface is a largely invisible reservoir of groundwater that exists almost everywhere.

Groundwater is a key component of the hydrologic cycle, and as such is integral to the health of our streams, lakes, wetlands, and associated ecosystems. Groundwater also sustains economic activity providing significant water supplies for industries involved in manufacturing, mining and petroleum and for agricultural purposes such as crop irrigation and livestock watering.

In Manitoba, approximately 25% of the population relies on groundwater for drinking water. Most of the rural population relies on groundwater from privately owned well systems. While such well owners are responsible for their own well, the underground aquifer is a resource for the benefit of all citizens and must be protected. It is with this in mind that we chose to conduct this audit.

1.2 OBJECTIVES, SCOPE, AND APPROACH

Objectives

Our audit focused on the risk management efforts of the Province regarding private (i.e., single household/domestic) water wells that supply drinking water for human consumption and answered the following questions:

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Scope

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Our work focused on activities conducted primarily during the period January 1, 2002 through March 31, 2003. Portions of our examination necessitated examination of records dating back to 2000 regarding water contamination events and back to 2001 regarding the well database and well driller's reports.

On November 20, 2003, subsequent to the completion of our fieldwork, the Government created the Department of Water Stewardship (Department). As a result, the Office of Drinking Water and the Water Branch of the Department of Conservation were transferred to this new department.

Approach

Our audit procedures included: extensive interviews and meetings with current and former staff of the Department of Conservation ,the Department of Water Stewardship, the Department of Health, the Manitoba Water Services Board, certain municipal offices and the three private water testing laboratories under contract with the Province for the Bacteriological Water Testing Subsidy Program. We also contacted a number of other provinces, the Federal Government's Prairie Farm Rehabilitation Administration, the Canada-Manitoba Infrastructure Program, and the Manitoba Water Well Association. We reviewed and analyzed relevant files, records, correspondence, and other supporting documentation.

We examined a sample of files or documents as discussed in the following sections:

- *Section 5*: 300 private water test results under the Bacteriological Water Testing Subsidy Program;
- *Section 6*: 7 of 35 bacterial contamination event files that resulted in boil water advisories between June 2000 and June 2002;
- *Section 7*: 29 well drilling license application files; and
- *Section 8*: 100 well driller reports.

During December 2002, we conducted a random telephone survey of 400 rural, private well owners in Manitoba. Survey questions were designed to address many of our audit criteria. Our survey findings are referred to, as appropriate, within the applicable audit finding sections of this report.

The size of the sample was sufficiently large to provide accuracy within (+) or (-) 5%. That means that if the average response for a question was 75% satisfied we have a 95% level of confidence that a similar response (i.e., results between 70% and 80%) would be reproduced 19 out of 20 times.

Through a series of questions, we confirmed that:

- Surveyed households were currently using a well to obtain their drinking water;
- The respondent was the owner of the land on which the well was located. We excluded families that were not the owners of the well, as we believed their knowledge on the history of the well would be limited;
- The respondent completing our survey was the person in the household that was the most knowledgeable about the family private well; and
- The household did not previously participate in the Department's private, rural water well sampling program that was conducted between September 1999 and September 2000 as noted in **Section 4.1.1** of our report.

Our examination was performed in accordance with value-for-money auditing standards recommended by the Canadian Institute of Chartered Accountants, and accordingly included such tests and other procedures we considered necessary in the circumstances.

Appendix A contains a glossary of terms used in this report.

2.0 Background

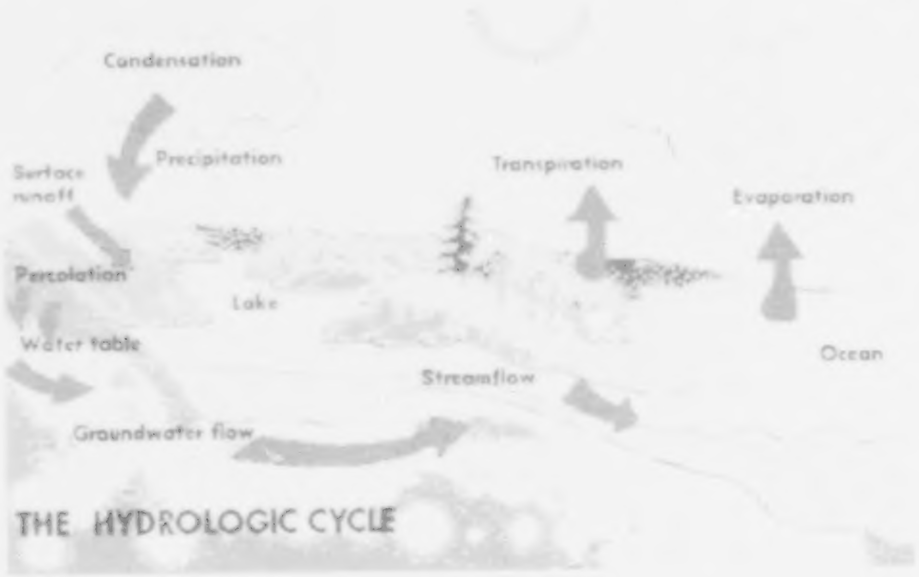
2.1 THE SOURCE OF OUR DRINKING WATER

Drinking water in Manitoba comes from two sources – surface water and groundwater. Both sources are vulnerable to contamination. Surface water is just what the name implies; it is present in lakes, rivers, streams, ponds, and wetlands such as marshes and bogs. Groundwater is water which is located below the soil surface and occupies the spaces between soil particles or cracks and fractures in bedrock. Underground areas or formations which are capable of holding and yielding useful quantities of water when tapped by a well are called aquifers. Most groundwater originates from rain or snow melt that soaks into the ground. Groundwater does not stay in the ground forever, and it does not lay still waiting for us to draw it from a well. The hydrologic cycle is the series of transformations that occur in the circulation of water from the atmosphere onto the surface, into the subsurface regions of the earth, then back to the surface and then returned to the atmosphere. Precipitation becomes surface water, soil moisture and groundwater. When precipitation falls on the land surface, part of the water runs off into the lakes and rivers. Some of the water seeps into the soil and groundwater formations. This process is called recharge. Eventually this water reappears above the ground. This is called discharge. Groundwater may flow into streams, rivers, marshes and lakes, or it may discharge in the form of springs or flowing wells. Groundwater discharge can contribute significantly to surface water flow. In dry periods, the flow of streams may be entirely supplied by groundwater. **Figure 1** shows the hydrologic cycle and how water moves from sources like precipitation onto the surface, into the ground, and back into the atmosphere.

The majority of Manitoba's population receives their drinking water from surface water sources, primarily due to the concentration of the Province's population in the City of

Winnipeg that receives its water from Shoal Lake in Ontario. However, groundwater is the primary water supply for approximately one quarter of the population and most of the communities in rural Manitoba.

FIGURE 1



2.2 WHAT CONTAMINATES OUR WATER

Contaminants

Both natural processes and human activity can adversely impact groundwater. Because water is a universal solvent, many substances are dissolved or mixed in groundwater. The addition of undesirable substances to groundwater caused by human activity is considered to be contamination. Examples of this are petroleum products leaking from underground storage tanks, nitrates and phosphates from overuse of chemical fertilizers manure or pesticides on agricultural land, leaching of fluids from municipal landfills, industrial waste disposal sites and leaking septic tanks.

Bacteria, viruses, protozoa, and other disease causing organisms can also contaminate groundwater.

Elevated concentrations of naturally dissolved elements such as arsenic, boron, fluoride, iron, radium and uranium may impact on the aesthetic quality of the water and, if present at higher concentrations, negatively impact public health.

Contaminant sources are often described under two main categories:

- *Point sources* are those that release contaminants from a specific, known location, such as underground storage tanks, septic fields, manure storage facilities, commercial/industrial facilities, landfills, and injection wells for liquid waste. Abandoned wells are not considered point source.

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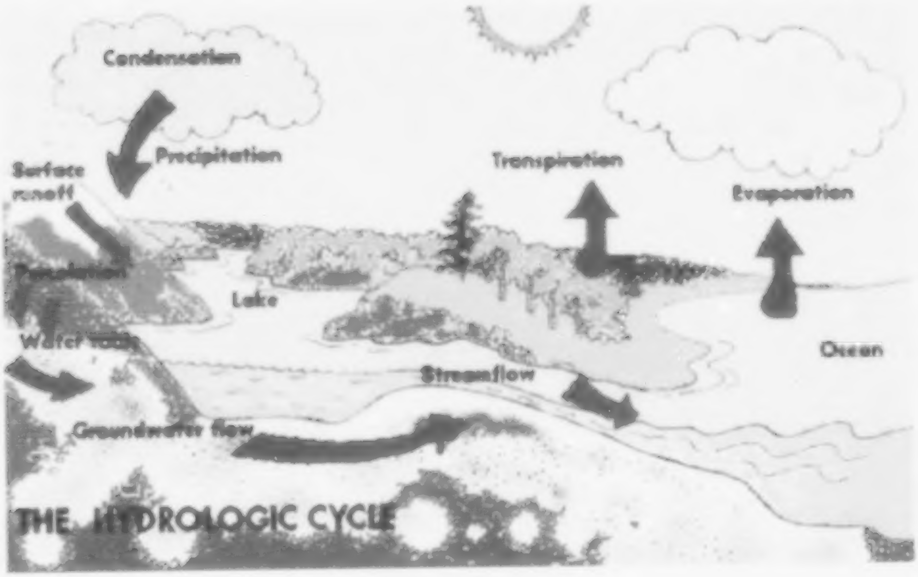

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Contaminant sources are often described under two main categories:

- *Point sources* are those that release contaminants from a specific, known location, such as underground storage tanks, septic fields, manure storage facilities, commercial/industrial facilities, landfills, and injection wells for liquid waste. Abandoned wells are not considered point source, but they can be a conduit or path for contamination to flow from the surface to the groundwater.

- *Non-point sources* are more extensive in area and disbursed in nature, making it difficult to trace contaminants back to their point of origin. Over-application of pesticides, chemical fertilizers or manure to fields or crops, road salts, septic systems, storm drains carrying runoff, movement of groundwater between contaminated and clean aquifers.

Whether water is safe to drink depends on the specific contaminants it contains, how much of each contaminate is present, and how these contaminants affect human health. Health Canada, through the Federal-Provincial-Territorial Committee on Drinking Water has identified a number of drinking water quality parameters for physical, chemical, radiological and microbiological contaminants. Their guidelines also contain a number of aesthetic parameters, and while not being hazardous to health, can alter the taste, odour, or colour of the water when present in excess quantities.

The Impact of Contaminants in Water

Of all contaminants normally found in drinking water, human and animal waste present the greatest immediate danger to public health. The effects from consumption of water contaminated by micro-organisms (or pathogens) such as bacteria, viruses or protozoa can range from a mild stomach upset to serious illness and death.

While the micro-organisms also cause an immediate health reaction, various other parameters can have a longer term impact. For example, infants under six months of age are susceptible to nitrate poisoning - a condition called blue baby syndrome. Nitrates reduce the ability of the blood to carry oxygen, causing infants to develop a bluish skin colour. It can be fatal. The *Guidelines for Canadian Drinking Water Quality* recommend that water should not contain more that 10 milligrams of nitrate-nitrogen per litre of water.

2.3 RESPONSIBILITY FOR DRINKING WATER

Responsibility for water is complex and often shared between the federal, provincial and local governments. Provinces have the primary responsibility for the management of water resources which includes both surface and groundwater and are responsible for:

- Flow regulation;
- Authorization of water use development; and
- Authority to legislate areas of water supply, pollution control, thermal and hydroelectric power development.

Federal responsibilities are in the areas that have the potential for significant national economic impact:

- Navigation; and
- Fisheries.

Water on Federal lands (e.g., National Parks), in territories, and on the reserves of Canada's aboriginal peoples fall under federal jurisdiction. The federal government is responsible for boundary and trans-boundary waters.

Shared federal-provincial responsibilities include:

- Inter-provincial water issues;
- Agriculture;
- Significant national water issues; and
- Health.

In Manitoba, the Department of Water Stewardship (the Department) was created in November 2003 and was given sole responsibility for protecting and managing water. Responsibility for water was previously vested with the Department of Conservation, primarily through the Water Branch and The Office of Drinking Water. These two branches were transferred to the Department of Water Stewardship upon its creation.

Figure 2 illustrates where responsibility resided as at March 2003.

FIGURE 2

Department of Conservation
Organization Chart as at March 2003

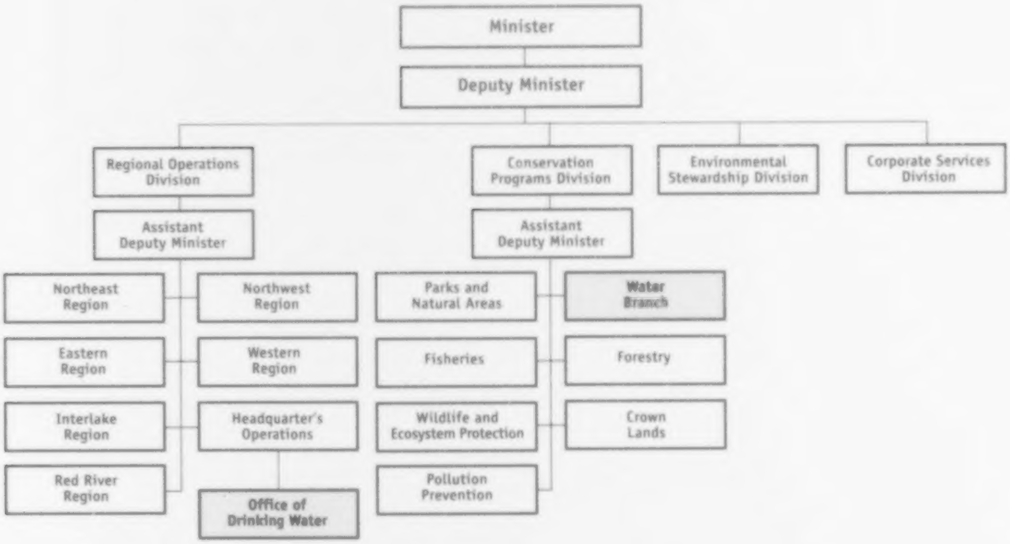
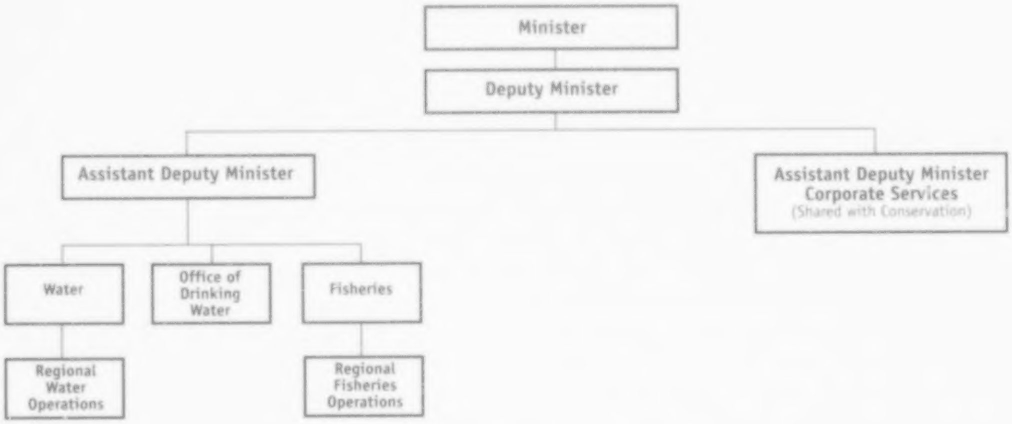

Minister
Deputy Minister
Regional Operations Division
Conservation Programs Division
Environmental Stewardship Division
Corporate Services Division
Assistant Deputy Minister
Assistant Deputy Minister
Northeast Region
Northwest Region
Eastern Region
Western Region
Interlake Region
Headquarter's Operations
Red River Region
Office of Drinking Water
Parks and Natural Areas
Water Branch
Fisheries
Forestry
Wildlife and Ecosystem Protection
Crown Lands
Pollution Prevention

Figure 3 illustrates where responsibility resided as at November 2003.

FIGURE 3

Department of Water Stewardship
Organization Chart as at November 2003


Minister
Deputy Minister
Assistant Deputy Minister
Assistant Deputy Minister Corporate Services
(Shared with Conservation)
Water
Office of Drinking Water
Fisheries
Regional Water Operations
Regional Fisheries Operations

The Department is responsible for administrating the water related Acts itemized in **Figure 4**. **Appendix B** includes a brief description of each of the water related acts.

FIGURE 4

Water Related Acts

The Conservation Districts Acts (C175)
The Drinking Water Safety Act (D101)
The Dyking Authority Act (D110)
The Manitoba Floodway Authority Act (F133) (formerly The Floodway Authority Act)
The Ground Water and Water Well Act (G110)
The Manitoba Habitat Heritage Act (H3)
The Lake of the Woods Control Board Act (L30)
The Red River Floodway Act (R32)
The Water Commission Act (W50)
The Water Power Act (W60)
The Water Protection Act (W65) (Not yet proclaimed)
The Water Resources Administration Act (W70)
The Water Resources Conservation and Protection Act (W72)
The Water Rights Act (W80)
The Manitoba Water Services Board Act (W90)
The Water Supply Commissions Act (W100)

Several other government departments are responsible for administering Acts that contain significant water related provisions. These departments and the Acts with significant water related provisions are itemized in **Figure 5**. The Department of Health's focus was, and continues to be, on public health aspects of water and identifying the parameters of what constitutes safe water. Although the Public Health Act and

Regulations fall under the responsibility of the Minister of Health, it is the Departments of Conservation and Water Stewardship who administer this Act. **Appendix B** includes a brief description of water related provisions.

FIGURE 5

Department	Act With Water Related Provisions
Department of Conservation	The Environment Act (E125) The Crown Lands Act (C340) The Dangerous Goods Handling and Transportation Act Act (D12) The Endangered Species Act (E111) The Provincial Parks Act (P20) The Sustainable Development Act (S270) The Wildlife Act (W130)
Department of Health	The Public Health Act (P210)
Department of Intergovernmental Affairs and Trade	The City of Winnipeg Charter (S.M. 2002, C.39) The Municipal Act (M225) The Municipal Board Act (M240) The Planning Act (P80)
Department of Agriculture, Food and Rural Initiatives	The Department of Agriculture, Food and Rural Initiatives Act (A40)
Department of Culture, Heritage and Tourism	The Heritage Resources Act (H39.1)
Department of Transportation and Government Services	The Highways and Transportation Act (H40)

Our audit focused on private water wells that supply drinking water for human consumption. Legislative provisions specifically related to private wells are summarized in **Figure 6**.

FIGURE 6

Department	Act	Section or Regulation	Purpose
Department of Water Stewardship	Ground Water and Water Well Act	Section 10(1) specifically and whole Act	*"No person shall drill a well without taking reasonable precautions to avoid polluting, or contaminating, or diminishing the purity of, ground water in the area."*
		Well Drilling Regulation	Licensing of well drillers; reports on well drilling activity; broad guidance for the construction and closing of a well.
Department of Conservation	Environment Act	Rockwood Sensitive Area Regulation	Specifies the need to obtain a permit to drill, modify or abandon a well.
Department of Health	Public Health Act	Protection of Water Sources Regulation	Protecting ground and surface water from contamination.
		Water Supplies Regulation	Broad guidance regarding the construction, maintenance, location and closing of a well.
Department of Water Stewardship	Drinking Water Safety Act	Sections 21(2), 22(1), 22(4) and 24 (unproclaimed)	Requirements for sampling, analysis, and reporting.

2.4 DRINKING WATER SYSTEMS

The extent to which drinking water is regulated by the Province depends primarily on the number of service connections to the water supply system. In Manitoba, three classifications of water systems are used. These are highlighted in **Figure 7**.

FIGURE 7

Drinking Water Systems in Manitoba

Water System Classification	Description	Estimated Number of Systems in the Province	Regulatory Framework
Public	Provides drinking water to the public and has 15 or more service connections.	350	Public Health Act and Water Supplies Regulation 330/88R and procedures under Guidelines for Public Water Systems 98-02. Drinking Water Safety Act. Regulations to be developed.
Semi-Public	Provides drinking water to the public but has fewer than 15 service connections (examples of semi-public systems include schools, hospitals, nursing homes, restaurants and banquet halls).	1,600 - 1,800	Broad provisions under Sections 2, 6, 7 and 8 of the Water Supplies Regulation. Drinking Water Safety Act. Regulations to be developed.
Private	Individual domestic drinking water systems.	35,000	

For public water systems, regardless of the source of the drinking water (surface or ground), there are prescribed monitoring (i.e., sampling and testing requirements) and treatment (or disinfection) regimes in place. The semi-public and private water systems are covered broadly under the noted sections of the Water Supplies Regulation under the Public Health Act which state:

Standards for water for domestic use

2 The quality of water for domestic purposes, in any residence, business, or industry shall meet accepted standards of potability subject to the approval of the medical officer of health or the minister.

Wells for domestic purposes

6(1) Wells constructed for domestic purposes shall be so located, constructed, and maintained as to prevent contamination of the water.

6(2) The medical officer of health or inspector may direct the methods of construction or the materials, or both the methods and the materials, that may be used to protect a water supply.

6(3) Where a well is no longer in use or is permanently abandoned, the owner thereof shall protect the water bearing formation against possible pollution as directed by the medical officer of health.

Defective system, unsatisfactory water or improper well

7(1) Where any public or private water supply system is found to be defective or the water unsatisfactory for domestic purposes, remedial measures shall be undertaken by the owner as directed by the medical officer of health.

7(2) The medical officer of health may order the reconstruction, disinfection, or closing of a well where, in his or her opinion, the water is unsafe or the well is improperly located, constructed, or protected.

Disinfecting water supply

8(1) All surface water shall be considered unsafe for domestic purposes unless boiled, chlorinated, or otherwise disinfected to the satisfaction of the medical officer of health.

8(2) All private drinking water derived from shallow wells shall be disinfected to produce a microbiologically safe water, but disinfection is not required in the absence of erratic or high coliform contamination or other contaminating factors.

During our audit there was no monitoring process in place for semi-public and private water systems in Manitoba.

2.5 WELLS IN MANITOBA

There are three basic types of water wells used in Manitoba:

- Drilled wells;
- Dug or Bored (Large-Diameter) wells; and
- Sand Points (Driven wells).

Drilled Wells

Drilled wells are generally 10 to 15cm (4 to 6 inches) in diameter for residential use. They are constructed where aquifers are capable of supplying water as quickly as it is pumped. Drilled wells tap water-bearing sand and gravel formations, as well as bedrock formations such as limestone and shale. Well depth varies greatly, depending on soil conditions and depth to the water level.

Dug or Bored (Large-Diameter) Wells

Dug or bored wells are typically 0.6 to 1.2m (2 to 4 feet) in diameter and are usually completed in shallow sand and gravel aquifers (15m [50 feet] or less). They are quite susceptible to contamination from surface sources and often have limited yield because of their shallow depths and dependence on recharge from the surface. In times of dry weather, these wells may provide only limited quantities of water.

Sand Points

Sand points are installed by driving a small diameter pipe (generally 5cm [2 inches] in diameter), equipped with a drive point and well screen, into shallow sand aquifers. They are often used in situations where the water table is not far below ground surface (9m [30 feet] or less) and where the aquifer is fairly permeable.

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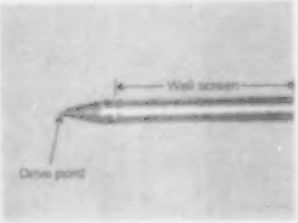

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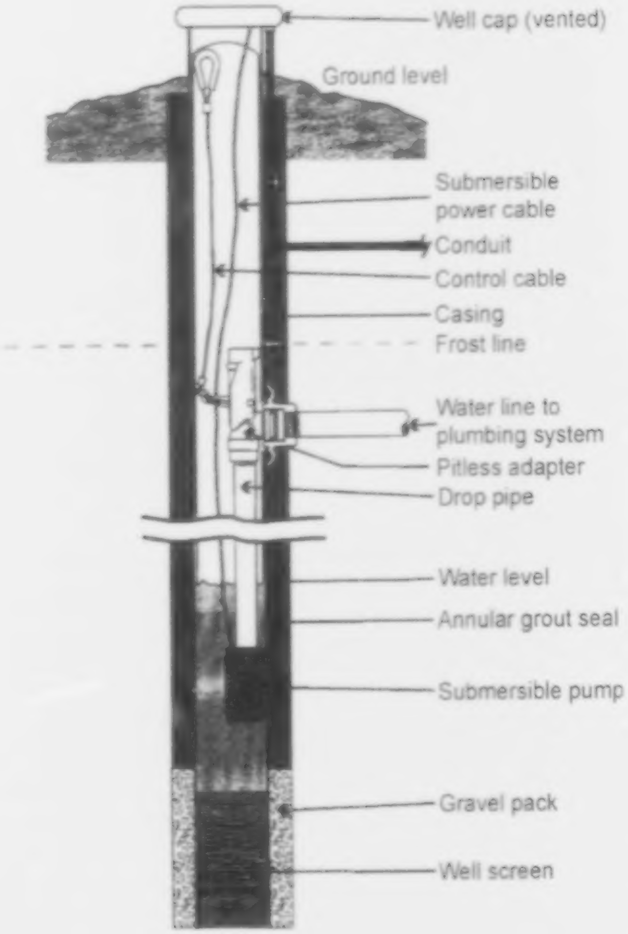
In 1963 the Ground Water and Well Water Act and the related Well Drilling Regulation came into force. These require that all well drillers obtain an annual licence and submit a *Driller's Report* to the Department for each well drilled. Also in 1963, the Department developed a database of information on wells drilled in the Province. The database now contains information on over 90,000 wells. The number of wells drilled varies from year to year. From 1999 to 2003 provincial records of new wells drilled range from about 1,600 to 2,300 with an average of about 2,000. The number of wells drilled for which well logs are not submitted to the Department (i.e., wells drilled by an owner on his land) is unknown.

The actual number of wells in Manitoba is not known. Estimates run as high as over 200,000. In terms of active drinking water wells, the estimate is about 35,000. The remainder would consist of wells used for industry or agricultural purposes and wells that have been abandoned.

Basic Components of a Drilled Water Well


Well cap (vented)
Ground level
Submersible power cable
Conduit
Control cable
Casing
Frost line
Water line to plumbing system
Pitless adapter
Drop pipe
Water level
Annular grout seal
Submersible pump
Gravel pack
Well screen

2.6 THE BACTERIOLOGICAL WATER TESTING SUBSIDY PROGRAM

The Bacteriological Water Testing Subsidy Program (Program) was established in October 2000, within the Department of Health, in response to recommendations from the Drinking Water Advisory Committee Report.

Two objectives were identified when the Program was established:

- To encourage water testing by homeowners; and
- To gather testing results in a data base for use in pattern surveillance.

Testing of water samples under the program began in May 2001 once a contract was in place with a testing laboratory. During the first year of the new program (May 2001 to March 31, 2002), only one contract was in place between the Department of Health and a testing laboratory to provide the testing services. The particular laboratory was the only one at that time able to meet the water testing accreditation standard required by the Province.

Under the Program, water samples are tested for the presence of total coliform bacteria and E.coli bacteria.

Annually, the Program subsidizes 70% of the cost for one test from a private water system and for up to four tests from a semi-public system.

When test results indicate the existence of coliform or E.coli bacteria in concentrations that exceed the maximum acceptable levels set out in the *Guidelines for Canadian Drinking Water Quality*, a re-test is recommended to see if remedial actions were successful in returning the water to an appropriate quality standard. The Program subsidizes 100% of the cost of a re-test.

In April 2002, the Program was transferred from the Department of Health to the Department of Conservation. For the second year of the Program (fiscal year ended March 31, 2003) three contracts were in place between the Department of Conservation and the testing laboratories to provide the testing services.

In late 2003, the Program was transferred to the newly created Department of Water Stewardship.

The Program is delivered through contracted laboratories. For the fiscal year ended March 31, 2003, 5,936 tests were performed by three accredited testing laboratories. Laboratories provide homeowners with a detailed report on test results, including recommended actions if needed, and the Department of Water Stewardship with weekly summary reports of the results of the tests performed.

2.7 RESPONSE TO CONTAMINATION

Water can be contaminated by a variety of substances. The most common is bacterial contamination.

The actions taken to deal with a bacterial contamination event are generally similar for all water systems (public, semi-public, private) and may include:

- Stopping the use of the water or boiling it prior to use;
- Interpreting the laboratory test results to determine the appropriate remedial action;
- Disinfecting the water system; and
- Re-sampling and testing of the water.

For public water systems, the Public Health Act and the Water Supplies Regulations require that direct public water suppliers test for chlorination levels and take water samples in accordance with established procedures. The specific procedures are described in the joint Manitoba Environment (Conservation) and Manitoba Health document, Guideline 98-02, *Guidelines for Public Water Systems: Chlorine Residual Testing and Reporting and Bacteriological Water Sampling, Submission and Interpretation*. The document provides guidance on actions to be taken by an operator of a public water system and the responsibilities and actions of various provincial staff when bacteriological concerns are identified.

For private water systems, as well as semi-public systems, the owner/operator is responsible for taking action following receipt of laboratory results indicating bacterial contamination. Both systems are presently unregulated and owners/operators are not required to advise the Province of any contamination of the water supplies. As such, Provincial staff will only become aware of contamination events through voluntary contact when the owner/operator seeks remediation advice. When Provincial staff receive a number of enquiries from one localized area, a concern regarding wide-spread bacterial contamination of the underlying aquifer may be raised. At this point, discussions may be held with other department staff, local officials and the Medical Officer of Health to develop an appropriate strategy.

Regardless of the water system used, if the source of the contamination cannot be immediately rectified and the water cannot be returned to normal conditions, a Medical Officer of Health, in consultation with Drinking Water Officers or Public Health Inspectors will direct community officials to advise residents of the need to boil their water before consuming and/or using (referred to as a boil water advisory). Boil water advisories are issued under the Public Health Act and Regulations.

It should be noted that certain contaminants, such as nitrates or other chemicals, would not be removed by boiling. In these situations, other instructions would be provided by the Medical Officer of Health.

3.0 Drinking Water Quality Standards

Does the Province have appropriate drinking water quality standards in place to protect public health?

WHAT WE CONCLUDED

Draft Manitoba drinking water quality standards are consistent with the Guidelines for Canadian Drinking Water Quality (Canadian Guidelines) published by the Federal Government. However, the Manitoba Water Quality Standards, Objectives, and Guidelines (Manitoba Guidelines) have not been finalized. Portions of the Manitoba Guidelines refer to drinking water quality standards.

The Drinking Water Safety Act was passed in August 2002 with the majority of sections being proclaimed in January 2004. Certain sections have not yet been proclaimed pending the development of related Regulations. Certain of the unproclaimed provisions relate to private water system sampling, analysis and testing.

We reached this conclusion by examining the following criteria:

- **Section 3.1: The Province of Manitoba should have water quality standards that meet recognized national drinking water quality standards**
- **Section 3.2: Water quality standards should be entrenched in legislation**

WHAT WE FOUND

3.1 MANITOBA'S DRINKING WATER QUALITY STANDARDS ARE CONSISTENT WITH FEDERAL GUIDELINES, HOWEVER THEY HAVE NOT BEEN PUBLISHED IN FINAL FORM

- Drinking water should be safe to use and aesthetically pleasing. Ideally, it should be clear, colourless, and well aerated, with no unpalatable taste or odour, and it should contain no suspended matter, harmful chemical substances or pathogenic micro-organisms.
- Appearance, taste, and odor are generally the characteristics by which the public judges water quality, and are therefore useful indicators of the quality of the water. However, water which is cloudy or colored, or has an objectionable taste or odor may not be unsafe to drink. Conversely, the absence of any unpleasant qualities does not guarantee the water's safety. The safety of water in public health terms is determined by its microbiological, physical, chemical and radiological qualities. Of these, microbiological quality is usually the most important as it has an immediate impact on a person's health.

- Manitoba is a long-standing member of the Federal-Provincial-Territorial Committee on Drinking Water. The Manager of the Office of Drinking Water is Manitoba's Representative to this committee and a senior official from Manitoba's Department of Health is a Liaison Officer between this committee and the Federal-Provincial-Territorial Committee on Environmental and Occupational Health. Through its participation in the Federal-Provincial-Territorial Committee on Drinking Water, Manitoba is able to access national expertise, data and resources and is able to leverage those resources and have water quality standards that are comparable to other jurisdictions and at a more cost-effective level than if they were developed in isolation.
- Through the Federal-Provincial-Territorial Committee on Drinking Water, Health Canada provides ongoing assessment of exposure and the impact on human health of a number of selected contaminants which could be present in tap and groundwater, in order to establish national drinking water quality guidelines. These guidelines are published as the *Guidelines for Canadian Drinking Water Quality* (Canadian Guidelines) and are recognized across Canada as the benchmark against which drinking water quality can be measured.
- The Canadian Guidelines describe a number of microbiological, chemical, physical, and radiological substances (both naturally-occurring and manufactured) that should not be present in drinking water in concentrations exceeding the Maximum Acceptable Concentration (MAC) or Interim MAC (IMAC) when a substance is under review. In addition, the Canadian Guidelines also contain a number of Aesthetic Objectives (AO) which denotes compounds that may not have a health impact, but can still be a nuisance. The Canadian Guidelines are continually being reviewed and updated for new information and technology changes. Information can be found on Health Canada's website (www.hc-sc.gc.ca).
- As the Canadian Guidelines are being continually reviewed and updated because of new information and technology changes, Health Canada publishes updates to them periodically, usually annually. The most recent update to the published 1996 Edition of the Canadian Guidelines is the April 2004 update, *Summary of Guidelines for Canadian Drinking Water Quality*. The summary lists new, revised and reaffirmed guidelines since the Sixth edition of the Guidelines were published. This summary of the Guidelines is reproduced in **Appendix C** of this report.
- In 1988 the Province issued, *Manitoba Surface Water Quality Objectives*. The document itemized the Province's water quality standards for surface water only. Since then the Province has released various drafts to reflect new scientific findings and to include groundwater:
    - In 2000, an initial draft of proposed revisions was released for comment by the general public, the scientific community, and affected stakeholders;
    - In February 2001, the resulting technical draft entitled, *Manitoba Water Quality Standards, Objectives and Guidelines* (Manitoba Guidelines), was released for comment; and

  - In November 2002 the final draft was released with a March 31, 2003 deadline for submitting comments. The final draft included all the parameter values for acceptable concentrations and aesthetic objectives that are found in the Canadian Guidelines. The draft also clearly identified that the parameters were the same for water from both surface and groundwater sources.

- To date the Province has not published a final version of the Manitoba Guidelines.

- One of the recommendations of the November 6, 2000 Drinking Water Advisory Committee Report by the Office of the Chief Medical Officer of Health was that *"The Province adopt the bacterial guidelines from the Canadian Guidelines as the standard for all drinking water systems in Manitoba"*.

- Department officials advised us that Manitoba, in practice, uses the Canadian Guidelines in assessing Manitoba drinking water quality. Our audit procedures under the Bacteriological Water Testing Subsidy Program (**Section 5.0** of this report) found that the parameters for the presence of total coliform and E. coli bacteria being testing under the program were the same as the maximum acceptable concentrations under the Canadian Guidelines.

- Further, the August 1998 Manitoba Environment/Manitoba Health Guideline 98-02, *Guidelines for Public Water Systems* under a section on Interpretation of Bacteriological Water Quality Analytical Results made reference to the Canadian Guidelines in stating that, *"Manitoba utilizes the values set out in Guidelines for Canadian Drinking Water Quality, produced by Health Canada, as criteria for establishing drinking water quality"*. Based on this criteria *"the maximum concentration for coliforms in drinking water is zero organisms per 100ml"*.

3.2 MANITOBA WATER QUALITY STANDARDS ARE NOT YET ENTRENCHED IN LEGISLATION - CERTAIN PROVISIONS OF THE DRINKING WATER SAFETY ACT NOT YET PROCLAIMED

- As noted in the prior section, the Province has not published a final version of the Manitoba Guidelines.

- Recently passed legislation, as noted below, contain provisions to address water quality standards.

  - On August 9, 2002 the Legislative Assembly passed the Drinking Water Safety Act and the Lieutenant Governor gave Royal Assent the same day. Section 3 of the Act includes a requirement that, *"Every public water supplier and semi-public water supplier must comply with the drinking water quality standards specified in the regulations"*. The Act was proclaimed, in part, in January 2004. Section 3 and the referenced regulation were excluded because the Manitoba Standards had not been finalized. Certain parts of the unproclaimed provisions, Sections 21(2), 22(1), 22(4) and 24, relate specifically to private water system sampling, analysis and testing.

- On June 16, 2005 the Legislative Assembly passed the Water Protection Act and the Lieutenant Governor in Council gave Royal Assent the same day. Section 2 of the Act states, *"The Lieutenant Governor in Council may make regulations setting or adopting water quality standards, objectives or guidelines"*. The Act will come into force on a day to be established by proclamation.

- Other jurisdictions such as Alberta, Ontario and Quebec have specified their drinking water guidelines in regulations. In these provinces, it can therefore be a criminal offense for water distributors to provide water that does not meet the regulatory standards.
- We recognize that a regulatory framework of water quality standards would only apply to public and semi-public systems for purposes of enforcement of these standards. However, describing the Manitoba standards in a published document supported by legislation would assist in communicating to all citizens what water quality parameters they should be expecting from their own water so that it is safe to consume, regardless of whether it is obtained from a public, semi-public or their own private water system.

4.0 Risks to Water Quality

Did the Province use the information it has gathered on private well water quality to adequately inform the public of private well water issues?

WHAT WE CONCLUDED

The Province had not adequately used information gathered to inform key stakeholders of the risks to water from private wells and of contamination occurrences in a timely manner.

By not developing a broad public awareness campaign, the Province cannot be reasonably assured that private well owners are aware of the contamination that exists throughout the Province and in their area, and the need to be vigilant in routinely testing their wells.

Specifically we noted that the Province had information on coliform bacteria risks, nitrates risks, high concentration of naturally occurring chemical risks, and on the status of the Drinking Water Advisory Committee Report recommendations that were not communicated to key stakeholders in a timely manner, and did not identify what citizens should be doing to address the risks as they apply to them.

Educating the public about water quality issues is a key element of drinking water protection. The more informed and knowledgeable citizens are about the risks of groundwater impairment, the better able they are to work proactively to reduce the risks of contamination and to ensure a safe supply of quality drinking water is available for all citizens.

We reached this conclusion by examining the following criteria:

- **Section 4.1: Information on findings of excess levels of contaminants in well water, including boil water advisories should be included in broad communications with all well owners**
- **Section 4.2: Reports and recommendations of a committee or task force established by the Government should be released publicly. A follow-up report on the implementation status of the recommendations should also be prepared and released publicly**
- **Section 4.3: Information on water related topics should be readily available and accessible**
- **Section 5.5: Information on contaminated wells should be recorded in a database to facilitate research**

With respect to our criterion dealing with a database of contaminated wells, we conducted this work as part of our review of the Bacteriological Water Testing Subsidy Program (**Section 5.0**). In **Section 5.5** of this report we note that a water test database is not in place.

WHAT WE FOUND

4.1 INFORMATION ON CONTAMINATION FINDINGS WAS NOT BROADLY COMMUNICATED TO ALL PRIVATE WELL OWNERS

4.1.1 Considerable Information Was Gathered By the Province

- Approximately 250,000 citizens of Manitoba are consumers of private well water. A number of initiatives conducted by the Province found occurrences of excessive levels of various contaminants throughout the agricultural regions of the Province:
    - According to the *Manitoba Clean Water Guide*, (circa 1997, a provincial publication that provides background information on Manitoba water resources and factors affecting them, information on water quality related issues, and information on how Manitobans can help protect and enhance water quality), *"High nitrate concentrations have been found in groundwater at a number of sites across the province. Manure and chemical fertilizers are two potential sources of nitrate contamination in groundwater".* The guide also stated, *"Although the quality of Manitoba's groundwater is generally good, local water quality problems are present. In some areas of the province, the concentration of uranium, fluoride, boron, arsenic, radium, iron, manganese, and nitrates exceed drinking water quality guidelines".*
    - Between September 1999 and September 2000 the Department conducted groundwater sampling throughout the agricultural regions of Manitoba to help gain a better understanding of rural water quality. Approximately 950 private, rural wells were randomly

sampled. The samples were collected on a basis of about one per 36 square mile township throughout the Province. Wells were tested for a number of parameters, most notably for nitrate, and for total coliform and E. coli bacteria.

- Test results indicated that:
  - 42% (393) of tested wells exceeded the Canadian Guidelines of zero organisms detectable per 100mL for total coliform bacteria;
  - 16% (152) of tested wells exceeded the Canadian Guideline of 10 mg/L for nitrate-nitrogen; and
  - 3% (26) of tested wells exceeded the Canadian Guideline of zero organisms detectable per 100mL for E. coli bacteria.
- Individual owners of the wells were notified of the results and advised to contact a Public Health Inspector for advice on any water related health concerns. However, a province-wide communication did not occur to advise all well owners in the Province of the potential risk that their well may also be contaminated. By not developing a public awareness campaign using their test results, the Province lost an opportunity to educate private well owners of the contamination risks that exist throughout the Province and the need to be vigilant in routinely testing their wells.
- More recently, test results under the Bacteriological Water Testing Subsidy Program found occurrences of total coliform and E. coli bacteria at levels exceeding the Canadian Guideline of zero organisms per 100ml. **Figure 8** highlights the test results under the Program for 2001/02 through 2003/04.

FIGURE 8

Bacteriological Water Testing Subsidy Program Test Results

Fiscal Year	Tests Performed	Test Results			
		Total Coliform Detected	%	E. coli Detected	%
2001/02*	9,539	3,941	41.3%	508	5.3%
2002/03	5,936	2,023	34.1%	235	4.0%
2003/04	5,073	1,623	32.0%	198	3.9%

* Part-year (May 11, 2001 to March 31, 2002)

4.1.2 There was No Targeted Public Awareness or Communication Campaign

- The Province has made available to the public various documents that discuss contamination concerns, for example, the *Clean Water Guide* (circa 1997, renamed in 2004 as the *Clean Water Handbook* and made available in the government's website) and the Department's Annual Report for the year ending March 31, 2001 which included summarized results of the 1999/00 testing program. However, there was not a communication campaign to advise all well owners in the Province of specifics regarding existing contaminants, the affected areas, the status of boil water advisories and the potential contamination risks in their area.
- We reviewed the government website and could not find information regarding local water conditions, including issued, amended or rescinded boil water advisories.
- We note that our survey of 400 rural, private well owners determined that only 20% tested their well water annually even though over 30% indicated that they have concerns about the quality of groundwater in their community. The greatest concerns identified were the impact of livestock operations and pesticides on water quality.

4.1.3 There is No Provincial Program in Place for Nitrate Testing

- The Province found in the 1999/00 private well water sampling program the existence of nitrates in 152 wells (16%) out of the approximate 950 private wells throughout the agricultural regions of Manitoba and that concentrations exceeded the Canadian Guideline of 10 milligrams of nitrate-nitrogen per litre of water.
- Nitrates have been found throughout Manitoba at levels in excess of the 10 mg/L Maximum Acceptable Concentrate guideline of the Canadian Guidelines.
- While the Province has established the Bacteriological Water Testing Subsidy Program, a similar program, in response to nitrate test results, is not in place.
- High nitrate consumption in infants can be fatal. Manure and chemical fertilizers are two potential sources of nitrate contamination in groundwater. This is important to consider given Manitoba's agricultural base. Domestic sewage and mineralization of soil organic matter are also potential sources of nitrate contamination.

4.1.4 Lack of Communication of Risk of High Concentrations of Naturally Occurring Chemicals in Certain Areas of the Province

- Our research found that the Province has identified certain areas of Manitoba where the groundwater contains concentrations of uranium, fluoride, boron, arsenic, radium, iron, and manganese that exceed the Canadian Guidelines. We observed that no strategy has been developed for communicating with persons living in these areas to raise their awareness of the risk to them that their well water may contain some of these chemicals in concentrations that exceed the drinking water guidelines and that they should consider periodically testing their water for the presence of these elements.

4.2 NO UPDATE ON THE IMPLEMENTATION STATUS OF THE RECOMMENDATIONS OF THE DRINKING WATER ADVISORY COMMITTEE

4.2.1 The Program

- In June 2000, the Drinking Water Advisory Committee (DWAC) was established by the Ministers of Health and Conservation to conduct a review of the reporting and follow up procedures for bacterial testing of all water systems in Manitoba. The Committee was chaired by the Chief Medical Officer of Health. In November 2000, the Office of the Chief Medical Officer released publicly the results of the Committee's work. The report contained 29 recommendations which were contained under the following five key areas:

    1. Need for one drinking water coordinating centre in Manitoba;
    2. Need to enhance the Province's program for private well water testing;
    3. Need to regulate and monitor semi-public water systems and strengthen the regulation and monitoring of public water systems;
    4. Need to improve education, training, communication and standards in all aspects of the Manitoba drinking water program; and
    5. Need for adequate resources to make the system work better.

- A public update on the implementation status of the report's recommendations has not been issued. Reports such as the DWAC report and its recommendations are a valuable source of information to Manitobans. A public update would help well owners understand the Province's efforts in protecting our water resources. Our survey of 400 well owners found that over 70% of the surveyed well owners thought that it was important that the province manage and protect groundwater. However only 40% were satisfied with the Government's efforts to do this. By not providing periodic, formal updates that communicate the status of actions taken, the province is not demonstrating accountability and transparency in it activities.

- While a follow-up of the DWAC recommendations was not included in the scope of this audit, we acknowledge that certain recommendations have been acted upon. For example, we noted that the Bacteriological Water Testing Subsidy Program (Section 5 of this report) was established in response to a DWAC recommendation. We also noted that amendments to the draft Manitoba Guidelines responded to a recommendation included in the report. The Committee recommended that *"The Province adopt the* *bacterial guidelines from the Guidelines for Canadian Drinking Water Quality as the standard for all drinking water systems in Manitoba".* However, as discussed in the following paragraph, we noted that the DWAC recommendation regarding the need for legislated testing for semi-public water systems has not yet been implemented.

4.2.2 No Legislated Testing Requirement for Semi-Public Water Systems

- There are approximately 1,800 semi-public water systems in the Province. Semi-public water systems include rural schools, hospitals, day cares, nursing homes, restaurants, banquet and community halls, and service stations. Despite the potentially large number of users, semi-public water system operators are not required by law to test their water.
- The Drinking Water Advisory Committee Report of November 2000 identified a need for the regulation and monitoring of the semi-public water systems and recommended that the Province establish a mandatory sampling and communication regime for these systems.
- In November 2001, the Departments of Conservation and Health jointly announced that new regulations to the Public Health Act would be developed for the semi-public systems and would require sampling, scheduling, monitoring and compliance. To date the regulations have not been issued and testing by the systems' owners remains voluntary.

4.3 INFORMATION TO ASSIST WELL OWNERS IS NOT READILY ACCESSIBLE

- Our survey of rural well owners identified a need to improve communication with the public. The results showed that approximately 65% of the homeowners thought that it was important or very important that information about water quality and wells be easy to find and useful. However, less that 50% were satisfied that information was easy to find and useful. Nearly 60% said they needed educational or resource information at some time on one or more well or water quality topics. Approximately 50% of those that needed the information went to the Government. A further 15% said they did not know the Government provided that type of information.
- Manitoba's guidance publications relating to water wells and well water are issued by four Departments and one agency. Appendix D lists the guidance publications available. The publications are dated from between 1985 and 2002.
- There was no centralized coordination or distribution of the publications. We found duplication between the publications, key topics for which publications were not available and inconsistent distribution.
- Regarding duplication, we noted that six topics were dealt with in two separate publications created by different departments. These topics were

bacterial contamination, sealing abandoned wells, testing well water, disinfecting wells, nitrates in water, and water treatment devices.

- With respect to distribution, we noted that the availability of the publications varied greatly across the Province. For example, we randomly contacted a number of municipal offices and district offices for the Departments of Conservation and Agriculture, Food and Rural Initiatives and enquired as to the availability of the Chief Medical Officer of Health's water "Fact Sheets". We found that the Fact Sheets were available at the Department of Conservation offices, but that they could not always be found in Agriculture offices and frequently could not be found in various municipal offices. In addition, we noted that the publications from the Manitoba Water Services Board were not widely distributed.
- Guidance publications were not available for critical topics including: selecting suitable well construction material for Manitoba's conditions; selecting suitable methods to grout well casings; conducting well yield tests; and maintaining a water well. We noted that the Water Branch of the Department of Water Stewardship was developing a Well Water Fact Sheet entitled, *Protecting and Maintaining Your Water Well.*
- Considering the high public interest that water issues have had in recent years, we found that the information available on the government's website in the recent past was limited, difficult to find, and predominately located through the Departments of Conservation, Health and Agriculture, Food and Rural Initiatives. The Office of Drinking Water did not have an Internet presence. Information on the Government's website was limited to links from Conservation's Water Branch to Environment Canada and to Manitoba's Department of Health. While the information contained on those pages was informative, important information specific to the Manitoba situation was missing. Such missing information included: discussion of contamination risks in Manitoba, locations throughout the province where certain risks are more predominate, the importance of protecting the water source, the methods available to improve the level of protection, and water treatment alternatives to ensure that the water is safe before it is consumed.
- After the creation of the Department of Water Stewardship in November 2003, we noted the creation of a Water Stewardship website with an Office of the Drinking Water component.

5.0 Bacteriological Water Testing Subsidy Program

Is the Bacteriological Water Testing Subsidy Program (Program) managing for results?

WHAT WE CONCLUDED

The Province could have been significantly more aggressive in defining and pursuing the objectives (managing the results) of the Bacteriological Water Testing Subsidy Program. The lack of a program uptake and the high frequency of positive coliform test results indicate that the Program should have been responding with a more aggressive communication strategy.

Very few private well owners are taking advantage of the Program – either because they are not aware of the program or because they feel they do not need to test their water, despite the fact that bacterial contamination is common throughout Manitoba.

The Department needed to be more diligent in ensuring compliance by laboratories to the terms and conditions of their contracts.

We reached these conclusions by examining the following five criteria:

- **Section 5.1: Eligibility criteria should be clearly defined.**
- **Section 5.2: Program performance should be measured and results used to improve program outcomes. (In this section we discuss the Program's objective of encouraging water testing by home owners).**
- **Section 5.3: A communication strategy should be in place to publicize the existence and benefits of the Program.**
- **Section 5.4: A contract management process should be in place to oversee contract requirements and to ensure that laboratories are complying with the contract.**
- **Section 5.5: The results of the water tests should be used for pattern surveillance.**

Our audit in this area consisted of interviews with department officials and officials from the three laboratories which were under contract with the Department of Conservation for water testing services for the fiscal year ended March 31, 2003. We reviewed the three contracts in place and reviewed the process followed in awarding these contracts. We also examined a sample of approximately 100 private water test results from each of the three laboratories. We did not review the system in place for payments made by the Province to the laboratories for its portion of the test costs.

WHAT WE FOUND

5.1 ELIGIBILITY CRITERIA IS NOT CLEARLY DEFINED

- Eligibility criteria have not been clearly defined. In our sample of test results we noted sample results from Ontario addresses, multiple tests, and tests being conducted for real estate agents.
- We found that the Department had not developed an operating manual for the Program. Such a manual could provide a documented framework for operating the Program. Key topics that could be addressed during the manual's drafting would include topics such as program eligibility, program performance, contract management, staff roles and responsibilities, data collection and analysis, and reporting.

5.2 PROGRAM PERFORMANCE INFORMATION NOT BEING ACTED ON

- A long-term strategy for the Program has not been developed. A long-term plan forms the basis for program measurement. Such a plan would include, among other things, strategies on how the objectives of the Program were going to be accomplished. As well, the plan would identify how and when progress toward those objectives would be measured.
- The Department has not developed performance measures and targets. We noted that the new Safe Drinking Water Act which was passed in July 2002 and proclaimed in January 2004 contains a provision that the Office of Drinking Water report on the Office's activities for its fiscal year ended March 31 to the Legislative Assembly by the end of September of each year.
- Although a formal performance measurement process has not been developed, we did examine the performance of the Program by looking at the two objectives that were identified when the Program was established in October 2000. The objectives are:
    - To encourage water testing by homeowners; and
    - To enable Manitoba to gather testing results for pattern surveillance.
- We address the first objective below and the second objective under **Section 5.5**.

As an indicator of the uptake success of the Program, we used the number of water sample tests that had been conducted under the Program. We also looked at the results of those samples.

In fiscal years 2002 to 2004, the Program's estimated uptake for budgeting purposes is shown in **Figure 9**.

FIGURE 9

Estimated Program Uptake

Test Type	Estimated Volume	Estimated Tests
Initial test	90% of the estimated number of private wells (35,000 x 90%)	31,500
Re-testing	40% of private wells tested (31,500 x 40%)	12,600
Total		44,100

Source: Department of Conservation

As shown in **Figure 10**, actual uptake from 2001/02 to 2003/04 was well below the volume estimated. The Program has not initiated any actions in an effort to improve uptake levels.

FIGURE 10

Bacteriological Water Testing Subsidy Program Participation

Fiscal Year	Estimated Number of Initial Tests	Actual Number of Tests	%
2001/02*	44,100	9,539	22%
2002/03	44,100	5,936	13%
2003/04	44,100	5,073	12%

Source: Department of Water Stewardship

* Part-year (May 11, 2001 to March 31, 2002)

In addition to the low uptake of the Program, **Figure 11** shows the number of tests that came back showing contamination by coliform or E. coli bacteria at levels that were above the level considered safe under the Canadian Guidelines.

FIGURE 11

Bacteriological Water Testing Subsidy Program Participation and Test Results

Fiscal Year	Tests Performed	Number of Test Results			
		Total Coliform Detected	%	E. coli Detected	%
2001/02*	9,539	3,941	41.3%	508	5.3%
2002/03	5,936	2,023	34.1%	235	4.0%
2003/04	5,073	1,623	32.0%	198	3.9%

Source: Department of Water Stewardship

* Part-year (May 11, 2001 to March 31, 2002)

- Also of note is that our survey indicated that well owners have a high trust that their drinking water is safe (92%), and as a result very few (only 17%) test their water annually. Approximately 25% have never tested their water. Most do not test their water after spring run-off (90%) or heavy rains (95%) when the risks of contamination are high. Interestingly, almost 50% took alternative measures to ensure that they had a safe supply of drinking water. Alternate measures included bottled or trucked-in water and the use of home filtration or water treatment systems.

5.3 PROGRAM COMMUNICATION STRATEGY NOT SUCCESSFUL

- Our survey found that only about 14% of those surveyed were aware of the provincial Bacteriological Water Testing Subsidy Program.
- Communication of the Program was limited to a mention in a November 2002 government news release in response to the DWAC Report and mention of the program in a non-prominent location in the Department's Internet site.
- The lack of uptake and the high frequency of positive coliform test results indicate that the Program should be responding with a more aggressive communication strategy about program availability and the need to test wells.
- Our survey of 400 rural well owners indicated that citizens have a high trust that their drinking water is safe and therefore they do not test their water. Our survey found that very few (only 17%) test their water annually. Twenty-five percent of those surveyed have never had their water tested. Most (90% - 95%) do not test their water after spring run-off or heavy rains when the risks of contamination are high.

5.4 THE DEPARTMENT DID NOT ENSURE THAT LABORATORIES COMPLIED WITH THEIR CONTRACTS

5.4.1 Bid Evaluation Assessments Are Not Documented

- We reviewed the tendering process for contracting water testing services for the fiscal year ended March 31, 2003. A formal public tendering process was followed with Request For Quotes (RFQ) bid invitation on the Canada-wide electronic tendering system (MERX).
- Three responses were received prior to closing. Responses were opened by the Evaluation Team which comprised staff from the Departments of Conservation and Health.
- While management advised that all three bidders met the RFQ requirements there was no documented bid evaluation to demonstrate this. Documenting the evaluation analysis helps ensure transparency in how decisions are reached. All three laboratories were awarded contracts for a one year period ended March 31, 2003.

5.4.2 Certain Terms and Conditions in Laboratory Contracts Could be More Clearly Stated

- For the fiscal year ended March 31, 2003 contracts were in place between the Department of Conservation and three testing laboratories. All three laboratories were accredited by the Standards Council of Canada and the Canadian Association for Environmental Analytical Laboratories Inc. Accreditation was a requirement under the RFQ and the subsequent signed contracts with the laboratories.
- The contracts document the arrangements between stakeholders (sample submitter, testing laboratory and the Province). The contract documents include: an Agreement, a Schedule A describing the services to be provided, a Schedule B which is the RFQ, and a Schedule C which is the Form of Offer by the bidder to undertake the work if successful.
- We noted five opportunities to clarify the contractual arrangements, as follows:
  - *Terms* - The RFQ contains a "Terminology" section which provides definitions for certain requirements as noted below. The Agreement does not provide similar definitions. It is therefore unclear how these requirements apply to the contract.
  - *Testing Turnaround* - We found that the testing turnaround time (from date of submission of the sample, to date of mailing by the laboratory, to date of receipt of results) was not clear in the contract. As prompt turnaround time of the results of a test to the public is important, this performance metric should be clear to all parties.
  - *Information Requirements (Summary test results)* - The contracts specified that the laboratories were required, *"on a weekly basis, provide to Manitoba Conservation electronic data and paper documents, respecting the type of testing, the number of tests, the test results, the location of the source of the drinking water supply, and assigned code, where applicable, the name, mailing address and phone number of the Submitter, and any other information requested by Manitoba for the purposes of the Program, the date and time of sampling, the date and time of testing, and the Fiscal Year to date cost for all testing to be reimbursed by Manitoba under the Program"*.

    We found that the summaries of the test results provided by the laboratories to the Department did not follow a standard template for the information required and were not in a common electronic format. As a result, an electronic merging of the summaries information was not possible. Management advised that this occurred because of the pending introduction of the Department's Environmental Management System (EMS). Although the contracts provide general guidance on the content of the information to be reported to the Department, as noted above, the contracts do not provide sufficient direction to the laboratories to ensure that the information gathered is consistent and sufficient to meet surveillance requirements of the Department.

- *Information Requirements (Water Test Submissions)* - The inconsistency in summary information provided to the Department can be attributable in part to the fact that the Department has not specified what information is initially gathered from the submitter of the water test when the water sample is provided to the laboratory. If the appropriate information is not initially gathered, it will not be available in the summary. Similarly, we noted that the information requested in the water test submission forms is not in a consistent format. Under the terms of the contract, *"the Laboratory must provide a standardized sample Submission Form, acceptable to Manitoba..."* As a result, the Province has the opportunity to provide further direction to the laboratories on the content of the Submission Forms to ensure that the information gathered is consistent and sufficient to meet surveillance requirements of the Department.
- *Testing Frequency* - We noted that, for the semi-public testing, the contracts provided for a maximum of four initial samples per year while the direction from Treasury Board identified a maximum of three tests per year. We did not search the test results for the semi-public system to identify if more that three initial tests were submitted.

5.4.3 No Laboratory Monitoring for Contract Compliance

- While contracts with the laboratories contained a number of requirements and performance expectations, we found that the Department had not yet conducted any monitoring procedures such as: ensuring required reports are received in a timely manner, are in the specified format, and are complete; analyzing the information received; and conducting on-site operational reviews. Contact with laboratory personnel was limited to periodic phone calls and e-mails.
- We visited the three laboratories and examined, from each laboratory, a random sample of 100 water tests conducted during the year ended March 31, 2003. An official from the Department accompanied our staff.
- We were satisfied that:
  - All samples were tested for the presence of total coliform and E-coli bacteria; and
  - The test results were compared against the appropriate drinking water quality standard.
- However, we noted that:
  - The five day turnaround expectation for sample results was frequently not met by one of the three laboratories. This laboratory exceeded the five day turnaround expectation in 36 of the 100 tests in our sample (11 by 1 day; 6 by 2-3 days; 18 by 4-13 days; and 1 by 18

days). We found that 13 of these 36 test results were positive for concentrations of total coliform that exceeded the Canadian Guidelines. The longer turnaround time increases the risk of illness to well owners and their families; and

- The legal descriptions of well locations were frequently not provided by any of the laboratories in their summary reports to the Department. We examined the summary reports for two weeks at random and found that for the 555 test results reported, only 85 legal descriptions were provided (15%). Legal descriptions are necessary if well result information is to be used for surveillance purposes.

5.5 TEST RESULTS NOT USED FOR PATTERN SURVEILLANCE

- An objective of the Program is to enable the Province to gather test results in a database for use in pattern surveillance.
- Because of deficiencies noted earlier regarding information requirements, regular and systematic analysis of test results of the Program was not occurring.
- Management advised that a drinking water database module is available as part of the Department's Environmental Management System (EMS), but that it has not been utilized because of other priorities and the need to initiate upgrades and improvements to the EMS to support the drinking water module. The Department's EMS was implemented in 2001.
- The lack of a database prevents the ready linkage of testing data to geographic areas for pattern surveillance. For example, in examining the test result summaries, we noted that key information was either not requested or missing. Testing information did not consistently identify the Rural Municipality so that data could easily be sorted and sent to respective regional offices for follow-up. Linking the test results data to geographic locations can assist in early detection of contamination.
- By combining the water test data with geographic data such as geological makeup, agricultural and industrial activities and other potential sources of contamination, surveillance activities could provide important insights into identifying the location and trajectory of potential or suspected contamination problems in particular areas of the province. Such a database may also be useful in medical research for identifying potential water-borne causes of high incidences of reported illnesses (epidemiological research).

6.0 Managing Water Contamination Events

Is the Province responding quickly and appropriately to bacterial well water contamination?

WHAT WE CONCLUDED

> The Province was responding appropriately to bacterial well water contamination events but the timeframe for issuing boil water advisories, in certain instances, was excessive.

We reached this conclusion by examining the following four criteria:

- **Section 6.1: Protocols should be in place that assign responsibilities and define needed actions when widespread aquifer contamination is suspected.**
- **Section 6.2: Investigations to determine probable cause of water contamination should be conducted in a thorough manner.**
- **Section 6.3: Boil water advisories should be issued in a timely manner. This is important because well owners and others affected may continue using the water without taking appropriate precautions.**
- **Section 6.4: Boil water advisories should contain detailed information on the contamination and courses of action to be taken. (i.e., the contaminant and the levels detected; when the problem was identified; the sample size and the tests performed; description of potential health impacts; actions well owners should take before consuming or using the water; what is being done to correct the problem; and contact persons).**

We interviewed officials from the Departments of Conservation, Health and Water Stewardship. We examined the files for a sample of 7 of the 35 bacterial contamination events that resulted in a boil water advisory issued between June 2000 and June 2002. All of our sampled events involved private wells. One of the boil water advisories that we examined was issued as a result of overland flooding which occurred in southeast Manitoba in June 2002.

WHAT WE FOUND

6.1 RESPONSIBILITY AND ACTION PROTOCOLS ARE NOT IN PLACE

- Protocols should be in place that assign responsibilities and define needed actions when widespread aquifer contamination is suspected.

- A responsibility and action protocol document provides guidance to the various stakeholders when potential wide-spread water problems are first suspected. Such a protocol would define the role and responsibilities of all concerned parties including an authority to "case manage" and oversee the investigations. It would trigger when an investigation should take place. As well it would document a coordinated communication process, including the issuance of boil water advisories, document the action steps to be taken immediately and in the longer-term, and define the file documentation standards.
- Many individuals could be instrumental in early detection of water contamination. They include; the well owner, well drillers or service technicians, local government officials, regional health staff, provincial or federal agriculture, environment or health officials. It is important that each are aware of the others' role and the communications that should occur so that timely and coordinated actions can be taken.
- In a potential outbreak of a water-borne disease or contamination event, timeliness of action is critical. Because of the number of parties that could be involved in dealing with a suspected or actual water contamination event, as well as the different levels of government, it is important that communication of information occur in a timely manner between all concerned parties. Delays in reacting could have significant health impacts on uninformed households due to continuing unprotected exposure to the contaminant.
- We found that a written responsibility and action protocol document has not been developed to provide guidance to the various stakeholders when potential wide-spread water problems are first suspected.
- Interviews with the Department, the Departments of Conservation and Health staff identified a need for such guidance to assist in ensuring that a consistent level of protection or response is afforded to all citizens.

6.2 ALTHOUGH INVESTIGATION PROTOCOLS ARE NOT IN PLACE TO GUIDE STAFF, INVESTIGATIONS APPEAR TO BE CONDUCTED THOROUGHLY

- An effective investigation process should encompass a number of factors including:
    - Documented protocols in place to initiate an investigation;
    - Investigations should be undertaken by individuals with appropriate qualifications;
    - Investigations should use acceptable methods of assessment;
    - Investigations should be sufficiently thorough to delineate the extent of contamination;
    - Investigations should be sufficiently thorough to determine the cause of contamination; and
    - Investigations should be conducted in a timely manner.

- We reviewed a sample of six files to assess the investigations conducted in light of the above factors. In each of the files, significant involvement by Department officials was evident. The files indicated that the Department generally conducted its investigations as follows:
  - Identified the water quality problem (Public Health Inspectors, citizens, or municipal officers);
  - Conducted site visits;
  - Conducted additional and/or re-sampling tests;
  - Reviewed the geological and hydro-geological conditions;
  - Reviewed the bacterial test results;
  - Prepared detailed geological and hydro-geological conditions report;
  - Met with local government council to discuss alternative course of action; and
  - Held a public meeting if considered necessary.

6.3 BOIL WATER ADVISORIES ARE NOT ALWAYS ISSUED IN A TIMELY MANNER

- In the 7 boil water advisory files that we examined, 3 were issued within 6 days of first awareness of the contamination (one of these was a precaution due to overland flooding), 1 was issued 10 days after awareness, and 3 were issued between 20 and 31 days after initial awareness. The Department's desire to conduct further testing, as part of their investigation, resulted in the four timeframes in our sample that exceeded seven days.

- While the Department has not defined what an acceptable time period would be, in our view, a timeframe greater than 7 days, from first becoming aware of a contamination event to issuing an advisory, is excessive.

- We noted that in one instance (the 31 day timeframe), the municipality issued a Cautionary Announcement two days after the initial positive test results came to their attention. We believe this was a prudent and wise action.

- While information available to us in the Department files did not indicate the occurrence of any adverse consequences due to the delay in issuing the four noted boil water advisories, a cautionary announcement at the start of any investigation would appear to be an appropriate practice to follow to help minimize the health risks. We note that Saskatchewan has a two level process. An "Emergency Boil Water Order" is issued when a threat to public health exists and a "Precautionary Drinking Water Advisory" is issued when a possibility of problems may exist.

6.4 BOIL WATER ADVISORIES ARE NOT PREPARED IN A CONSISTENT FORMAT

- A standard protocol for communicating drinking water advisories to the individual well owners would include:
    - The contaminant and the levels detected;
    - When the problem was identified;
    - The sample size and tests performed;
    - Description of potential health impacts;
    - Actions well owners should take before consuming or using the water;
    - What is being done to correct problem, when the situation is expected to be resolved, and what conditions must be met for this to occur; and
    - Contact persons.

- We noted a number of inconsistencies and/or deficiencies in the 7 boil water advisories in our sample. Most did not include sufficient information of the situation at hand (excluding a boil water advisory due to overland flooding because situational information is largely not applicable). Specific omissions related to:
    - Concentrations of bacteria found and the applicable Canadian Guideline;
    - When the problem was identified;
    - Number of samples taken;
    - Type of tests performed;
    - The health risks were not discussed. The boil water advisories we examined only included general statements such as *"may not be safe for consumption"*. More useful statements would specifically identify the health impact (i.e., stomach cramps, diarrhea, headaches, dizziness, etc.). Persons who have suppressed immune systems (such as, persons who have HIV/AIDS, persons who have had organ or bone marrow transplant, or who have had cancer treatment) are at greater risk from water-borne diseases. For these people infection may be more severe and may become life-threatening. Babies, the very elderly, and those whose health is fragile due to chronic disease are also more vulnerable to serious complications;
    - The length of time for which water should be boiled before consuming was not indicated;
    - While the boil water advisories we examined distinguished between boiling for drinking and the use of unboiled well water for general domestic purposes, only 2 of the 7 advisories referred to the Provincial guide entitled, *"What do I do when a boil water advisory is issued"*, which includes valuable information on how to safely use the water. See **Appendix E** for the full text of this guide; and
    - The messages regarding when boiling can cease were inconsistent:
        - 2 were silent in this regard,
        - 2 indicated "until further notice",

  - 1 indicated to continue boiling even when the owner's well subsequently tested negative for bacteria,
  - 1 indicated to cease boiling once tests were negative for bacteria, and
  - 1 indicated "until the problem was considered resolved".
- These deficiencies likely occurred because there are no protocols to guide the Medical Officers of Health or the municipal offices in drafting the advisories.

7.0 Licensing of Well Drillers

Is the Province appropriately managing the licensing of well drillers?

WHAT WE CONCLUDED

The Province is not appropriately managing the licensing of well drillers. As a result, the licensing process does not sufficiently ensure the protection of consumers and groundwater.

We reached this conclusion by examining the following criteria:

- **Section 7.1: License "eligibility" criteria should be driller competency oriented.** Competency based criteria would include:
  - Certification as a well driller from a qualified association;
  - Ability to obtain minimum insurance requirements;
  - Evidence of continuing training;
  - Satisfactory reference checks from previous clients and lack of complaints; and
  - History of complete, accurate and timely submission of well driller's reports as required by the Ground Water and Water Well Act and Well Drilling Regulation (see **Section 8** of this report).
- **Section 7.2: Adequate review procedures should be exercised when processing applications.**
- **Section 7.3: New licences should be issued before the existing licences expires.**
- **Section 7.4: Enquiries and complaints should be tracked and followed-up.** Such a system would include:
  - Preparing telephone, mail or electronic mail logs;
  - Providing brief descriptions of the complaint or enquiry;
  - Resolving the problem if it can be addressed immediately;
  - Identifying further actions required and communicating the item to another person for resolution; and
  - Providing reports to senior management on a regular, periodic basis.

We examined the well-drilling licences in place for the 2002 calendar year, reviewed the well drilling licensing requirements in Alberta, Ontario, Nova Scotia and Prince Edward Island, and also interviewed Department staff.

WHAT WE FOUND

7.1 LICENCING CRITERIA ARE NOT DRILLER COMPETENCY ORIENTED

- The licensing of well drillers is legislated under The Ground Water and Water Well Act (G110) and the related Well Drilling Regulation (223/88) and subsequent amendment (123/89).
- The Ground Water and Water Well Act requires that all persons engaged in the business of drilling water wells be licensed by the Province. The forms to be used, the licence fees to be paid, and terms and conditions of the licence are contained in the related Regulation.
- Water well drilling is a highly specialized and technical occupation. Well drillers do not just drill the hole, they also construct the well. Well drillers need to possess the knowledge and physical strength to operate a variety of drilling rigs and other equipment used to drill residential, commercial and industrial water wells. To find "potable" water that is clean and safe to drink, well drillers must also have knowledge and skills respecting groundwater geology and hydrology, well construction and design, well maintenance, water quality and water contamination, water analyses and treatment, as well as job site safety including hazardous materials, fire prevention and safety training.
- Because wells are drilled into aquifers which serve a number of citizens, improperly constructed wells can have a significant and long term impact on the quality of water in the aquifer and affect more that just the one user that the well was developed for.
- According to the article, *Protecting Ground Water and Wells*, by Alberta Agriculture, Food and Rural Development:

> *"One of the easiest ways to contaminate a groundwater source is to drill a well. An improperly constructed well can provide direct access for surface contaminants to flow into the groundwater source below. Some chemical and bacterial contaminants can be extremely difficult, if not impossible, to correct by pumping or disinfecting the well. In most cases, the only options to resolve these health concerns is to install costly water treatment equipment or abandon the well."*

- The purpose of licensing drillers should be to ensure they possess the skills and abilities necessary to appropriately complete the work they were hired to do. Poor drilling practices and poorly constructed wells can cause or contribute to groundwater wastage, degradation, and the transfer of water between aquifers (i.e., cross-contamination). Poor workmanship can result in further costs to the well owner to repair the well or to drill another well.

- Neither the Act, nor Regulation specify licensing criteria. We noted, however, that some competency related information is requested in the licence application form (**Appendix F**), specifically the driller's last three wells drilled and the number of years of experience in drilling water wells.
- While Manitoba does not require certification or demonstration of minimum knowledge before a licence is issued, we noted that certain other jurisdictions in Canada (Alberta, Ontario, and Nova Scotia) had either:
    - requirements for successful completion of a well contractor or well technician examination;
    - mandatory certification as a well driller (We noted that the Canadian Ground Water Association provides certification of groundwater drilling technicians and groundwater pump technicians upon satisfactory completion of a combination of field experience and a written examination. In addition, the Association has ongoing technical upgrading requirements.); or
    - examination and application scrutiny by an advisory board.

We noted that legislation is also silent regarding minimum insurance requirements that drillers should maintain for licensing. Mandatory insurance requirements would assist in strengthening consumer protection and provide citizens with recourse for faulty workmanship. Further, including a demonstrated history of preparing complete, accurate and timely driller's reports as a licensing criterion would help promote heightened compliance to the driller's report requirement (**Section 8**).

7.2 LICENCES ISSUED WITHOUT ADEQUATE REVIEW

- Pursuant to Section 2 of the Well Drilling Regulation 228/88, each applicant must complete the standard *"application for licence to carry on the business of drilling water wells"*. While standard application forms were used by the Department we are concerned that licences were approved even though:
    - application forms were incomplete, and
    - submitted contacts for the last three wells drilled were not contacted by the Department.

7.2.1 Incomplete Applications Were Approved

- Program staff approved incomplete applications. For 2002, only 18 of 29 applicants provided all the required information.
- **Figure 12** describes the information that was missing from the 11 incomplete applications. Of particular note is that contact information regarding the last three wells drilled was frequently not provided. In our view, this is critical information to assess ongoing driller competency. Staff indicated that they approve applications with missing information

because they are familiar with the drillers and believe the drillers are competent. Upon further enquiry staff acknowledged that the Department did not know the quality of work being done by drillers.

FIGURE 12

Incomplete Application	Information Missing From Application			
	Reference Information	Number of Wells Drilled	Years of Experience	Description of Equipment
1	X		X	
2	X			
3	X			
4	X			
5	X			
6		X		
7	X			X
8	X	X		
9		X		
10	X			
11	X	X		
Total	9	4	1	1

Source: OAG Sample Reviewed

7.2.2 References Not Contacted

- Although 20 of the 29 applicants provided contact information for the last three wells drilled, the Department did not contact these individuals. Similar to the explanation noted above, Department staff did not contact drilling references because they were familiar with the drillers and believed they were competent. Program staff indicated that complaints are considered before a licence application is approved and that no major complaints had been received in 2002. (See **Section 7.4** regarding the logging of complaints.)
- A contributing factor to the above noted deficiency may be that there were no documented policies and procedures in place over the licensing process to guide staff. Approving applications without a rigorous analysis of the required information increases the risk that consumers will be exposed to poor drilling practices.

7.3 RENEWAL PROCESS ONLY OCCURS AFTER LICENCES HAVE EXPIRED

- Well Driller's licences expire annually on the last day of December.
- Officials advised that the Department mails out licence applications to all well drillers in January after the licence expiry date. By following this practice, well drillers operate for a part of the year without a licence.

- For 2001 the Department's well database indicated that 128 wells were drilled between January 1 and March 31, 2001 (28 in January; 13 in February; and 87 in March). We selected twelve of the larger drillers and found these drillers had drilled 47 wells in this time period prior to receiving a licence for the 2001 calendar year.

7.4 COMPLAINTS AND ENQUIRIES NOT LOGGED

- The Department did not have a formal system in place for tracking complaints and enquires about well drillers.
- Department officials advised that complaints against well drillers were infrequent and would not support the need for a formal tracking system. However they also advised that general enquires from citizens and from other departments were frequently received and that staff did spend considerable time addressing these enquiries. Staff indicated that to minimize the paperwork generated, they attempt to resolve complaints and enquires as they are received and that management would be advised verbally of any major complaints received.
- Formally tracking the resolution of all complaints and enquires would provide department officials with the ability to ensure that all complaints and enquiries were being addressed in a timely and appropriate manner and that complaints were appropriately considered during the license renewal process. In addition, periodic review and analysis of the tracking log would identify trends or frequently asked questions which may be indicative of the need to change some aspects of the way the Department delivers its services.

8.0 Monitoring of Well Drilling Activities

Is the Province ensuring that well drillers and well owners are complying with appropriate water well standards?

WHAT WE CONCLUDED

> The province's legislative framework, water well standards development and monitoring activities by the Department are insufficient to ensure that well drillers and owners are in compliance with The Ground Water and Water Well Act. As such, the Province has not minimized the risk of well water contamination resulting from poor well construction or maintenance practices.

We reached these conclusions by examining the following criteria:

- **Section 8.1: Comprehensive water well standards should be in place and entrenched in legislation.**
- **Section 8.2: Drillers Reports should be complete.**

- **Section 8.3: Drillers Reports should be received in accordance with the legislative timeline.**
- **Section 8.4: Information in Drillers Reports should be acted on.** (When information is requested of a third party, it should be duly reviewed and analyzed when received. To do otherwise is to indicate that the information is not important or useful.)
- **Section 8.5: Applicable legislation should require appropriate and timely reporting on wells drilled by homeowners using personal equipment.** (The Department needs to be aware of their existence in a timely manner in order to assess the risk factors and to determine whether immediate remedial actions are required by the homeowner. This is important because all wells pose a potential risk to the affected aquifer.)
- **Section 8.6: Abandoned well information should be received by the Province.**
- **Section 8.7: A water well inspection program should be in place.** (A comprehensive well inspection program would include:
    - a multi-year well inspection plan that would identify inspections to be conducted:
        - on a random basis,
        - as part of an investigation of a potential widespread groundwater contamination event,
        - in response to citizen or well driller enquires or complaints,
        - on wells located in high risk areas, for example wells in sandy or rocky soil conditions, in shallow aquifers, and in the Rockwood Sensitive Area (see **Section 9**),
        - on wells constructed by homeowners using personal equipment, and
        - on wells for which a boil water advisory has been issued;
    - a documented process, including forms;
    - communication and education activities.

  Inspections are important because they ensure wells are constructed to appropriate construction standards and that wells are appropriately maintained by the owners.)

Our audit in this area was conducted during September to November 2002, with the exception of our work on **Section 8.7** that was conducted in February 2003.

We interviewed a number of key stakeholders including Department staff, mainly in the Groundwater Section and in the Office of Drinking Water, technical staff at the Prairie Farm Research Agency, officials of the Manitoba Water Well Association, and groundwater protection and well drilling program staff in Ontario and Alberta. We reviewed groundwater and well drilling legislation and guidelines in Alberta, Ontario, Nova Scotia and Prince Edward Island. We also reviewed a number of publications including: *Best Management Practice - Water Wells* issued by Ontario Ministry of Agriculture, Food and Rural Affairs, *Water Wells That Last for Generations* issued by Prairie Farm Research

Administration, Alberta Environment and Agriculture Food and Rural Development, and *Guidelines For Water Well Construction* issued by the Canadian Ground Water Association. We also reviewed water well literature issued by several states in the United States of America.

We examined a sample of Driller's Reports for the year ended December 31, 2001. For that year, a total of 1,623 drillers' reports were received. We identified the 12 well drillers that submitted the most reports and selected a sample of reports from each of these drillers, for a total of 100 reports.

WHAT WE FOUND

8.1 DETAILED WELL CONSTRUCTION, MAINTENANCE AND ABANDONMENT STANDARDS ARE NOT IN PLACE

- There are no detailed technical standards in legislation over the construction, maintenance or abandonment of wells in Manitoba. Standards are lacking specificity and legislation is fragmented and largely outdated.
- Existing Acts and Regulations include standards that are very broad and speak to the outcomes to be achieved but do not provide practical, technical direction to the well contractor, well owner, or other stakeholders (see **Appendix H** for extracts of the pertinent Acts).
- The Ground Water and Water Well Act and the related Well Drilling Regulation authorize department staff to inspect wells, conduct studies, examine the equipment and records of water well drillers and well owners, and require that all reasonable precautions be taken to prevent groundwater contamination.
- The Ground Water and Water Well Act and related Well Drilling Regulation have for the most part remained unchanged since they were enacted back in 1962 and 1963. An example of how existing legislation refers to broad outcomes rather than specific standards is found in the Well Drilling Regulation of the Ground Water and Water Well Act:

  > *"In completing a well installation, which includes constructing a well pit, installing a pumping system, and making underground connections to the well, the well driller shall take* ***adequate precautions to prevent surface water from entering the well.****"* *(emphasis added).*

- Specific standards are available in certain regulations regarding separation distances for locating sources of contamination such as manure storage facilities, waste disposal systems (e.g., septic tanks/field) and waste disposal grounds from nearby wells. (See **Appendix I** for extracts from regulations regarding separation distances.) However, there are no distance requirements for locating new wells away from the sources of contamination.
- The Ground Water and Water Well Act also authorizes that regulations can be established to carry out provisions of the Act, including:

  - regulating the methods of drilling wells;
  - records to be kept;
  - prescribing specifications and standards for casings, equipment, and materials used in drilling wells;
  - regulating the spacing and depth of wells;
  - prescribing specifications and standards for the maintenance of wells by owners; and
  - regulating closure of abandoned wells and prescribing methods to be used.

- The need for detailed water well standards was inferred in a 1995 National Hydrology Research Centre [Environment Canada] report entitled, *Groundwater in Manitoba: Hydrogeology, Quality Concerns, Management*:

  > *"Bacterial contamination of groundwater supplies is quite common in Manitoba. The vast majority of problems appear to be very local and directly related to well construction and maintenance...*
  >
  > *Most bacteria problems could likely be eliminated by proper well construction practices (installation and grouting of adequate lengths of casing, eliminating the use of large diameter well pits), locating well up-gradient from potential sources of contamination and proper well maintenance."*

- Alberta, Ontario, Prince Edward Island, and Nova Scotia have incorporated in one legislative instrument their province's standards for the construction and servicing of water wells. For example, Alberta's Water Regulation 205/98 specifies that:

  > *"No person shall use or permit the use of materials in the drilling, construction, maintenance, servicing or monitoring of a water well unless the materials:*
  >
  > *a) are new and uncontaminated, and*
  >
  > *b) meet or exceed the specifications set out for that material and purpose by the Canadian Standards Association or the American Society for Testing and Materials."*

- Prince Edward Island's Water Well Regulation specifies that:

  > *"No person shall use, in the construction of a well, pitless adapters, well seals, well caps, piping and fittings, and pumping equipment materials which do not conform to the standards specified in Schedule B."*

  Schedule B describes the various well components such as casing, pitless adapter, distribution pipe, plumbing equipment, values and fittings and the related standards for those products set by the standard setting body.

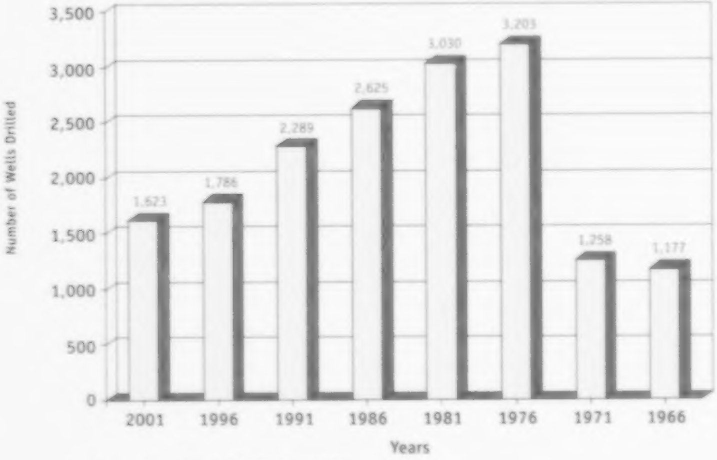
- In **Appendix J** we compare in greater detail, Manitoba's water well legislation with that of Alberta.

8.2 DEPARTMENT ACCEPTS INCOMPLETE DRILLER'S REPORTS

- Section 7 of the Well Drilling Regulation specifies that a well driller is required to report on every water well constructed using the prescribed Driller's Report. For effective monitoring, it is important that all required information be received. Penalties for non-compliance should be in place and utilized.
- Information from the driller's reports is accumulated in the Department of Water Stewardship's electronic well database. The database includes data for about 95,000 water wells drilled as far back as 1887.
- The following **Figure 13** shows the number of wells recorded in the noted years.

FIGURE 13

Annual Number of Wells Drilled and Recorded on a 5 Year Basis (According to GW DRILL Database)



Source: Department of Water Stewardship

- The database is used by a variety of stakeholders both internal and external to the Department. The database provides information for the understanding of local geological and hydrogeological conditions and is an integral part of the information needed for mapping regional groundwater systems. Well drillers can use the database information to research local geological conditions prior to drilling a new well. The database is available to well drillers and stakeholders on a compact disc.

8.2.1 Incomplete Data

- The driller's report form developed by the Department requests information regarding well location, well owner, well and water use, well sketch, geological composition, well construction specifications, pumping test results, and contractor name and licence number. This type of information is similar to that found in the driller's reports required by other Canadian jurisdictions. (See **Appendix K** for the driller's report form.)
- According to Department staff, due to the volume of reports on hand for review and entry, the review process is limited to ensuring that reports contain the legal property and soil description data. In our sample of 100 reports we found that many of the driller's reports were missing required data. Figure 9 lists the key data elements that were frequently missing. We noted that 7 of the 12 drillers in our sample never provided data for between 4 and 6 of the key data elements. This indicates a systemic exclusion that can only be resolved by specific direction to the drillers. We noted that no guidance was available to well drillers on how to complete the report.
- Staff advised that they do not return incomplete reports to well drillers for completion or correction. However, they further advised that when legal property descriptions are not provided, they edit such reports internally, where possible, using maps and other reference tools. Regardless of this effort, our sample included 10 reports without a complete legal property description, key to identifying the location of the property.
- We note that Section 11 of the Act, Offence and penalty, specifies that:

  > *"Every person who contravenes or fails, neglects or omits to comply with a provision of this Act or the regulations or an order of the minister is guilty of an offence and is liable, on summary conviction, to a fine of not more than $100 for each day upon which the offence is repeated or continued."*

- The failure to submit appropriately completed driller's reports would, in our view, be a contravention of the regulations. The Department has not utilized this enforcement provision in an effort to obtain the information required.

FIGURE 14

Key Data Elements	Driller's Reports Missing Key Data Elements (sample of 100 reports)
Well Location	
Location sketch of well	85
Legal property description	10
Geological Composition	
Kind of water	79
Well Construction Specifications	
Name of supplier of material	72
Depth of casing grout	34
Type of work done on casing or screen	17
Height of casing above ground level	11
Pumping Test Results	
Water temperature	96
Duration of pumping test	47
Pumping level at end of test	25
Recommended pumping rate	18
Pumping rate	7

Source: OAG Sample Reviewed

8.2.2 No Certification by Well Drillers Regarding Compliance or Truthfulness

- We noted that while the driller's reports required a signature by the well driller, 29 of the 100 reports we examined were not signed, the majority being from one well driller. More importantly, the signatures are not linked to a well driller representation regarding compliance to legislation and truthfulness of the data submitted. Such a certification would remind well drillers of their responsibilities.
- We noted that Alberta's water well drilling report requires the contractor's signature after the following statement:

> *"The well was constructed in accordance with the Water Well Regulation of the Alberta Environmental Protection and Enhancement Act. All information in the report is true."*

8.3 THE DEPARTMENT IS NOT ENFORCING THE LEGISLATED DRILLERS REPORTING TIMELINE

- Pursuant to Section 7 of the Well Drilling Regulation, drillers are required to submit a Driller's Report within five days after a well is constructed.
- 11 of the 34 well drillers licensed for 2001 did not submit reports for that year. Staff speculated that the reasons for non-submission are likely

due to retirement, illness or a lack of business. Staff also advised that one of the eleven well drillers has a history of not submitting reports.

- The Department did not date stamp well driller's reports when received. Nevertheless, staff indicated that most well drillers only submit reports after completion of the busy drilling period, that is, during the winter season. This is well beyond the five day time frame specified by the Regulation. Staff advised that they do not contact well drillers for required reports during the year.
- Consequently, because most well driller's reports are received within a relatively short time span after the completion of the construction season, this creates immediate data entry backlogs. Officials advised that driller's reports are not entered into the database immediately upon receipt but rather whenever existing or relief staff become available. We noted that as at March 2003, approximately 17% (272) of the drillers' reports for 2001 and 29% (450) of drillers' reports for 2002 had not been recorded in the well database.
- Staff indicated that the task of recording water well data from reports into the well database is not a top priority in relation to other more pressing work demands. However, information in the database should be up to date because the database provides valuable reference information to Department staff when doing their work including: investigating potential water contamination sites; providing information on hydrological composition to rural municipalities to help the Livestock Technical Review Committee comment on a proposal; and evaluating the impact on an aquifer of groundwater withdrawal for licenses under the Water Rights Act.
- We noted that the five day reporting requirement is very aggressive relative to the time frames in other Canadian provincial jurisdictions that we examined. Well drillers have thirty days to report in Nova Scotia, Ontario and Saskatchewan and sixty days in Alberta.

8.4 REPORTS NOT USED TO ASSESS CONSTRUCTION PRACTICES

- Department staff advised that the driller's reports were intended to be historical records of wells drilled and to facilitate research and responding to enquiries. As such, staff do not review driller's reports to determine whether wells are properly constructed and are in compliance with legislated requirements and guidelines.
- While onsite inspections conducted during actual well construction or abandonment are the best way to assess whether a well is properly constructed, maintained or abandoned, much can be learned about the construction practices used by a driller from detailed scrutiny of the driller's report. Information in the driller's report that may indicate inadequate driller practices include the pumping test duration, use of a "pitless unit", height of the casing above the ground, and material used.

- We considered in greater detail the analysis of the duration time of pumping tests. The Canadian Ground Water Association water well construction guidelines recommend the test be conducted for at least 2 hours. Our review of the driller's reports revealed instances of inadequate pumping test durations. For the 53 driller's reports in our sample that included pumping test information, the time reported ranged from 15 minutes to more that 180 minutes, with 26 of the 53 reporting 60 minutes (**Figure 15**).

FIGURE 15

Duration of Pumping Test (in minutes)	Number of Driller's Reports
15	1
20 to 25	4
30	4
60	26
120	11
180	4
More than 180	3

Source: OAG Sample Reviewed

(Shaded results indicate duration of tests at or exceeding the time recommended by the Canadian Ground Water Association.)

- The pump test is important because the information gathered during the test assists the well driller in determining the rate at which the well should be pumped and the depth at which to place the pump. During the pump test, water level measurements are recorded as the water level draws down. After two hours, water removal stops and the recovery of the water level is monitored and recorded. Measurements must be taken at specific time intervals for a two hour period or until the water level returns to 90% of its original level. Once the yield test is complete the well driller will decide at what rate the aquifer can be pumped without lowering the water level below the top boundary of the aquifer. In addition, repeating the test at a later date can be used to assess any changing conditions of the well and determine when maintenance is required.
- We noted that the driller's report does not require the following pumping test information:
    - pump test method used;
    - water level measurements immediately before pumping starts and at specified intervals during pumping and after pumping stops; and
    - a representation on whether the pumping test was continuous.
- In Alberta, the well driller is required to report on the above-mentioned information.

8.5 DRILLER REPORTS ARE NOT REQUIRED FOR WELLS CONSTRUCTED WITH PERSONAL EQUIPMENT

- The Ground Water and Water Well Act does not apply to wells developed by an owner using their own equipment to obtain a personal water supply. Records of shallow wells dug using readily available equipment such as backhoes are not reported to the Province.
- In 1999/00, as part of the Rural Groundwater Quality Initiative, the Department tested 953 private water wells but found that well data for approximately 467 wells were not recorded in the well database. The database was subsequently updated for these missing wells. Reasons for this missing data include the possibility that some wells were drilled prior to 1963 or that they were personally drilled wells using personal equipment.

8.6 THERE IS NO LEGISLATED REQUIREMENT FOR REPORTING ON WELLS THAT ARE ABANDONED

- When wells are not being used, it is important that they be properly closed or sealed. Proper sealing of wells prevents the migration of contaminants down the well to the aquifer below.
- Section 15 of the Well Drilling Regulation states, *"Where a well is dry or abandoned, the owner shall fill and seal it in a manner sufficient to prevent vertical movement of water in it."* However, the Regulation does not require that well drillers and home owners provide the Department with an abandoned well report.
- Nonetheless, the Department has developed an abandoned well report form and has provided supplies of the three part form to well drillers. In addition, the form is available on the Department's internet site. The Abandoned Well Report form requests critical information on the location of the well and the extent of well closing procedures carried out. (**Appendix L** shows the abandoned well report form).
- Prior to 2001, information on abandoned wells was only recorded in the Department's well database in the "remarks" field for a noted well, rather than in searchable fields. To address this deficiency, the Department was in the process of upgrading the well database to incorporate key data elements regarding closing procedures. We noted that the Department had accumulated over 300 abandoned well reports as at November 2002 (over the prior 18 months) for input at a later date.
- Officials advised that, similar to their practice with well driller's reports, abandoned well reports are not reviewed to assess the appropriateness of the closing procedures utilized.
- Our survey of well owners indicated that 30% of the well owners surveyed had an abandoned well on their property, and of these, 24% indicated that they had not properly closed their well to ensure that the aquifer was protected.

8.7 A COMPREHENSIVE WELL INSPECTION PROGRAM IS NOT IN PLACE

8.7.1 No multi-year inspection plan in place

- Department staff indicated that an inspection program has not existed since 1985, when the last well inspector position was vacated and the position was not refilled.
- Department staff indicated that well inspections are only conducted in response to suspected wide-spread groundwater contamination. These inspections, conducted at the request of Department officials, are normally part of a broader investigation to determine the source and extent of the contamination, and usually involve a number of wells in a local community. In 2001 and 2002, 34 ground water investigations were conducted which included 15 well inspections.
- The results from our survey of 400 well owners indicate a high frequency of wells that may be inadequately constructed, maintained or located. We believe these findings support the need for a proactive, multi-year inspection program.
- We assembled our survey responses for a set of questions pertaining to the physical features of the home owners' wells. Only 17% or 67 well owners could meet all of the following critical characteristics:
  - well was located uphill from the surrounding land;
  - casing extends at least 30 cm (12 in) above the surface and at least 15 metres (50 ft) below the surface;
  - casing in visibly good condition; and
  - the cap is securely attached.
- We assembled the responses for another set of survey questions pertaining to the distance of a private well away from various contamination hazards. As shown in **Figure 16**, many wells may not be appropriately located.

FIGURE 16

Percent of Surveyed Well Owners Whose Wells are Located Closer to the Potential Source of Contamination than the Minimum Distances Required

Well located within 30 meters/100 feet of:	
- barn or feedlot	10%
- chemical or fuel storage	5%
- sinkhole, quarry, excavation or abandoned foundation	5%
- abandoned well	14%
- septic tank, field, or gray water pit	65%
Well located within 50 meters/160 feet of:	
- manure pile or compost bin	6%
Well located within 100 meters/325 feet of:	
- livestock manure storage facility	9%

Source: OAG Survey Results

8.7.2 A Documented Well Inspection Process is in Place

- We examined the files for 4 of the 15 inspections conducted in 2001 and 2002 in response to suspected wide-spread aquifer contamination. We noted that a standard inspection form was introduced in 2001 for use by the Department in conducting well site inspections. The form allows for the collection of basic well information and an assessment of the major risks to the well. In order to complete the form, a visual inspection of the well head and the area surrounding the well is conducted. In addition, specific risk factors are assessed including:
    - the separation distances from potential contamination sources;
    - the position of the well to the gradient of surrounding land;
    - the well age and type;
    - the casing depth, diameter and height above ground surface; and
    - the condition of the well cap.
- To support a well inspection, photographs of the well site are usually taken and well logs generated from the well database reviewed.

8.7.3 Sharing of Information With Well Drillers is Limited

- Department staff advised that prior to 1985, a formal outreach function was delivered through a well inspector position. The function ceased when the position was vacated.
- An outreach function would include, for example, following up with well drillers if they failed to submit driller's reports, or if they submitted incomplete driller's reports (see **Section 8.2**); communicating with individual well owners on specific items of concern; and organizing periodic information sessions with well drillers or community groups on broader topics such as technical updates on well drilling, well construction, well maintenance, new or proposed legislation and programs, and emerging groundwater contamination issues.
- Notwithstanding the lack of an outreach function, staff advised that they frequently provide advice over the telephone to both the well drilling community and the public and, where warranted, provide public informational presentations to communities affected by water contamination events. In addition, as part of the annual licence renewal letter, the Department provides drillers with a copy of the one page Water Well Guidelines developed by the Manitoba Water Well Association. Approximately every five years, drillers are provided with copies of The Ground Water and Water Well Act and the Well Drilling Regulation.
- We noted that staff had not prepared a summary of the key provisions of the Acts and Regulations that impact on well construction to ensure that well drillers were aware of all legislated requirements (see **Section 9** of this report regarding the lack of driller awareness of the Rockwood Sensitive Area Regulation). Groundwater and well drilling related Acts and Regulations include:

  - The Environment Act and certain Regulations:
    - Livestock Manure and Mortalities Management Regulation,
    - Onsite Wastewater Management Systems Regulation,
    - Waste Disposal Grounds Regulation, and
    - Rockwood Sensitive Area Regulation;
  - The Water Rights Act;
  - The Public Health Act and certain Regulations:
    - Water Supplies Regulation, and
    - Protection of Water Sources Regulation.

- Department officials advised that well construction issues identified through well site inspections are typically not broadly communicated to all well drillers. Communicating findings that result from well inspections would be a good way to promote practices that reduce contamination risks. Officials indicated that issues identified include:
  - casings not extending sufficiently above ground level,
  - wells not properly sealed or capped, and
  - wells located in well pits or close to unsealed abandoned wells, or located close to contamination sources such as septic tanks or fields.

9.0 Drilling in the Rockwood Sensitive Area

Is the Province ensuring that drillers are obtaining permits prior to drilling in the Rockwood Sensitive Area?

WHAT WE CONCLUDED

The Province did not ensure that permits required under the Rockwood Sensitive Area Regulation were obtained by well drillers or homeowners prior to drilling, modifying, or abandoning wells. As a result, numerous wells were drilled in the Rockwood area without the required permits.

WHAT WE FOUND

- From September 1991 through to March 1992, the Province and a private company tested a number of wells in the Rural Municipality of Rockwood. The tests showed that several of the wells had concentrations of solvents used as degreasers at a company's plant that exceeded the Canadian Guidelines of 50 parts per billion.

- In July 1994, under the Environment Act, the Province issued regulation 121/94 - "Rockwood Sensitive Area Regulation". The Regulation was considered necessary to prevent the spread of groundwater contaminated by the solvents. Per the Regulation, no person shall drill or modify a well within the Rockwood Sensitive Area, except under the authority of a permit issued by the Department. Areas affected by the Regulation include Stony Mountain and portions of the Rural Municipalities of Rockwood, St. Andrews, Rosser and West St. Paul. The Regulation applies to residential, agricultural, commercial and exploratory wells. The Regulation was developed following a period of public consultation that included area residents, well drillers and municipal governments.

- Management advised us that well drillers and various stakeholders (including the affected rural municipalities, the Manitoba Real Estate Board, and the Manitoba Water Well Association) were notified of the Rockwood Sensitive Area Regulation by letter in July 1994. The letter described the permit application process, and identified the required forms. A copy of the Regulation was also provided. However, since that time, periodic notices have not been issued by the Department to remind well drillers and stakeholders of their obligations.
- Permits are issued by the Department of Conservation's Regional Operations Division from its Interlake Regional Office in Selkirk. Staff advised that since the inception of the Regulation, they have issued 5 permits to drill a well, 21 to abandon a well, and none to modify a well. They also advised that no applications for permits to drill or modify a well have been received since 1997.
- Staff in the Department of Water Stewardship in Winnipeg, who are responsible for monitoring the well driller's reports and for maintaining the well database were unaware of the permit requirements and accordingly were not monitoring driller's reports for compliance to the Rockwood Sensitive Area Regulation, and to the terms and conditions of the permits. By examining the well database and enquiring of Department of Conservation officials, we determined that 47 wells, over a period of 8 years (1994 to 2001), were drilled by ten different drillers in the Rockwood Sensitive Area without the required permits. These wells may have increased the risk to the area's groundwater. Better coordination between departments could have detected the inappropriate drilling activity as soon as the driller's reports were received by the Department of Water Stewardship (formerly the Water Branch).
- During the audit, when advised by our Office of the drilling in the Rockwood Sensitive Area without a permit, Department officials took steps to review well logs of the non-permitted water wells and the results of previously prepared water sampling reports prepared by consulting engineers to identify if these wells posed an immediate health risk. As a result of this initial assessment, management advised that they did not believe that any of the non-permitted wells were located in areas of the aquifer which contained groundwater with solvent contamination in concentrations greater than drinking water guidelines. Further detailed evaluation was planned by the Department.

10.0 Recommendations

FOR THE PROVINCE

Drinking Water Quality Standards

- That the Province review and finalize its water quality standards, objectives, and guidelines, as per the latest November 22, 2002 draft document on a priority basis. As well, that the Province draft related regulations regarding private system sampling and analysis. These actions, in turn, may then facilitate the proclamation of Section 3 of The Drinking Water Safety Act and The Water Protection Act and communicate an understanding of standards for water quality that all citizens should be aware of regarding their source of drinking water.

Risks to Water Quality

- That the Province establish a centralized function to coordinate the development, maintenance and distribution of well water-related publications and align this information with the Water Stewardship website.

Managing Water Contamination Events

- That the Province establish a cautionary announcement process to ensure well owners are aware of the potential contamination problem while the Province continues to conduct its investigation to determine whether a boil water advisory is justified.

Monitoring of Well Drilling Activities

- That the Province introduce a requirement for all persons to submit a report on well drilling activities regardless of the ownership of the equipment used.

FOR THE DEPARTMENT

Risks to Water Quality

- That the Department develop a broad, periodic communication program targeting private water system owners to ensure they are knowledgeable of risks to water quality in Manitoba. The communications should stress the need to regularly test their well water and the nature of the tests needed.
- That the Department, in consultation with the Office of the Chief Medical Officer of Health, develop a protocol for communication to private well owners of existing events of contamination (bacterial, nitrate, metals, chemical).

- That the Department, in consultation with the Office of the Chief Medical Officer of Health, assess how best to respond to nitrate testing results and the identification of high concentrations of naturally occurring chemicals in certain areas.
- That the Department provide the Members of the Legislative Assembly with a written update of the status of the recommendations contained in the Drinking Water Advisory Committee report.

Bacteriological Water Testing Subsidy Program

- That the Department develop an operating manual for the Bacteriological Water Testing Subsidy Program.
- That the Department develop a performance measurement framework related to the broad objective of encouraging homeowners to regularly test their water.
- That the Department develop an appropriately detailed and targeted Bacteriological Water Testing Subsidy Program awareness campaign in an effort to increase uptake.
- That the Department document the evaluation of bids in future contract offerings.
- That the Department, with the assistance of Civil Legal Services, clarify the terms and conditions included in its standard contracts and requests for quotations. The Department should also clarify its information requirements needed from sample submitters and laboratories so that consistent well location information is obtained with each sample.
- That the Department develop and implement appropriate monitoring procedures to ensure laboratories comply with contract requirements and performance expectations.
- That the Department implement a database of private well testing results suitable for pattern surveillance purposes.

Managing Water Contamination Events

- That the Department develop a responsibility and action protocol document in consultation with all key stakeholders.
- That the Department document investigation protocols.
- That the Department coordinate with Department of Health officials and develop content and format requirements for boil water advisories.

Licensing of Well Drillers

- That the Department, in consultation with well drillers and other stakeholders, review licensing certification and insurance requirements of well drillers, pump installers and other servicing technicians. We further recommend that licensing criteria be included in the regulations to The Ground Water and Water Well Act.

- That the Department return incomplete applications to the applicant for completion.
- That the Department review its current licensing process and develop the policies and procedures that are found necessary to improve the process.
- That the Department review the requirement of providing and contacting references as part of its overall review of the current licensing process.
- That the Department conduct the licence renewal process before the end of the calendar years.
- That the Department develop a system to formally track complaints and enquires made to the Department.

Monitoring of Well Drilling Activities

- That the Department, in consultation with well drillers and other stakeholders, develop appropriate standards for the drilling construction and sealing of water wells and incorporate these standards in legislation.
- That the Department return incomplete driller reports to the relevant driller for completion and that enforcement provisions be acted upon if the required information is not forthcoming.
- That the Department, in consultation with well drillers, develop effective means of outreach and communication to promote proper completion of driller's reports.
- That the driller's reports include a standard certification by the well drillers as to compliance with applicable legislation and truthfulness of the data submitted.
- That the Department, in consultation with well drillers, pursue an amendment to the legislation to implement a reasonable and enforceable timeline for the filing of well driller's reports. In the interim, that the Department take reasonable steps to enforce the existing Regulation.
- That the Department ensure the timely recording of driller's reports in the water well database.
- That, once appropriate well drilling and construction standards are in place, the Department review and analyze drillers' reports in sufficient detail to determine whether those standards have been met and direct remedial action where necessary.
- That the Department review the requirements related to the pumping test, including the type of data collected and reported in the driller's report.
- That the Department proceed to incorporate in a Regulation appropriate requirements for the completion and submission of abandoned well reports.
- That once appropriate well sealing standards are in place, the Department review and analyze abandoned well reports in sufficient detail to determine whether those standards have been met and direct remedial action where necessary.

- That the Department enhance its outreach function to better ensure the periodic sharing of information with well drillers.
- That the Department develop a multi year, comprehensive inspection plan.
- That the Department develop an annual summary of the key findings from its well inspections, including a discussion of better practices that could have prevented the problem, and that the document be shared with all well drillers.

Drilling in the Rockwood Sensitive Area

- That the Department continue to assess whether the wells drilled without a permit in the Rockwood Sensitive Area have increased the risks to the area's groundwater, and that appropriate remedial actions, as needed, be undertaken.
- That, on a go forward basis, the Department examine well driller and abandonment reports for compliance with the Rockwood Sensitive Area Regulation, and that instances of non-compliance be communicated to the Department of Conservation's Regional Operations Division for immediate investigation of the risks posed.
- That the Department, as part of its annual licensing process, remind all well drillers of the permit requirements of the Rockwood Sensitive Area Regulation, as well as the penalty provisions under the Environment Act for non-compliance to the Act and Regulations.
- That the Department notify Manitoba Conservation's Regional Operations Division of instances of non-compliance with the Rockwood Sensitive Area Regulation, and that Manitoba Conservation take appropriate enforcement action under The Environment Act.

Response from Officials

Acknowledgment and encouragement by the Auditor General with respect to the "positive steps" taken by the Province "to improve risk management efforts regarding private wells" is greatly appreciated.

In this regard, the Department has implemented a number of the actions recommended by his office since the substantial completion of its audit in June 2003. Of particular note is the significant progress that has been achieved on a broader basis with respect to the Province's comprehensive approach to protecting Manitoba waters. That is, the Province published its "Manitoba Water Strategy" in April 2003, it established a new Department dedicated to water issues in the form of Manitoba Water Stewardship in November 2003, and in June of 2005, Manitoba's Legislative Assembly passed Manitoba's Water Protection Act. These initiatives, which followed passage of the Drinking Water Safety Act in 2002, demonstrate the Province's commitment to ensuring that management of this vital resource is approached in a methodical manner *that appropriately addresses healthy drinking water, healthy ecosystems, and its prudent and sustainable use. This holistic approach establishes a comprehensive and broader framework within which improvements, such as those recommended by the Auditor General, will continue to be implemented.*

Specifically, and with respect to recommendations within this audit, consultations on Drinking Water Safety Act regulations were completed in 2004 and legal drafting is nearing completion. Proclamation of the balance of the Act and enactment of the regulations, including drinking water quality standards and guidelines, is imminent. The Department's Office of Drinking Water currently applies the national Guidelines for Canadian Drinking Water Quality. The proposed Drinking Water Standards Regulation under our new Drinking Water Safety Act will incorporate a number of these guidelines as standards that must be met by public and semi-public water systems. It is noted that Manitoba Water Stewardship maintains an extensive network of approximately 600 observation wells located in major aquifers throughout the province and performs annual sampling and chemical analysis within this network to help determine baseline quality of groundwater, water quality trends and water quality problems as they may arise. The Department will continue to expand its educational role to include communication of drinking water standards and guidelines and related health risks to private well owners.

With respect to water quality, Manitoba's new Water Protection Act includes the power to establish ambient water quality standards, objectives and guidelines in regulation. The Department will seek proclamation of provisions of the Water Protection Act and enactment of this particular regulation early in 2006. Manitoba will be the first jurisdiction in Canada to prescribe ambient water quality standards, objectives and guidelines in law.

The Department broadly publicized the need for well-testing and proper precautions, during the spring and summer of 2005. The Department waived all fees for bacterial testing and carried out a special media communication campaign to inform Manitobans of the availability of free testing. This action was promoted by the increased risk of well water contamination from severe rainfall events and observations from the surveillance of analytical results from the ongoing provincially subsidized private well testing initiative. These efforts have raised public awareness of the importance of well testing. The day-to-day work of 12 Drinking Water Officers, whose positions were established by the Province in 2003, has also helped to improve awareness of the importance of testing and the subsidy program.

The Department has completed a "Draft" Consumer's Guide for owners of private water systems that includes general information on wells and water testing, wellhead protection and selection and maintenance of water treatment units. The Province is in discussions with Health Canada on opportunities to expand this guide to a national document. In addition, *new educational documentation is currently under development and will be placed on the Water Stewardship website for public access.*

The Department has also held discussions with the Office of the Chief Medical Officer of Health regarding development a broader communication program to ensure private water system owners are knowledgeable about existing events of contamination and risks to water quality (in addition to bacterial contamination).

The Department is currently finalizing its first annual report on activities of the Office of Drinking Water, required by Section 5 of the Drinking Water Safety Act, and the Minister of Water Stewardship will table the report in the Legislature shortly. This report will incorporate a status report on Provincial actions in response to the Drinking Water Advisory Committee recommendations.

The 2005 tender for contracts for bacteriological testing for all program areas was based upon the advice of Civil Legal Services and included a documented and rigorous bid evaluation process. Response protocols for private water samples have been incorporated into the new regulation being finalized under the Drinking Water Safety Act and these protocols ensure that the owner is contacted when a health threat is suspected.

A Provincial Medical Officer of Health has been assigned to act as a liaison with Water Stewardship and provide related direction to regional Medical Officers of Health. Options for inclusion of a cautionary advisory process within the boil water advisory protocol will be discussed with Manitoba Health.

The Department has undertaken discussions with the Manitoba Water Well Drillers Association with respect to certification and licencing and is to review related provincial procedures and policy, including monitoring of well drilling activities and drilling in the Rockwood Sensitive Area.

Manitoba Water Stewardship has initiated a review of the Ground Water and Water Well Act and the Well Drilling Regulation. Although the current Act and Regulation provide the foundation for protecting and managing the Provinces groundwater resources, it has become necessary to provide more detailed information on how this should be done, including appropriate standards for the drilling, construction and sealing of water wells.

These activities would build upon amendments to The Groundwater and Water Well Act that were passed by the Legislative Assembly in June 2005 (not yet proclaimed) which grant powers to the "Director" to require the rehabilitation or sealing of abandoned or improperly sealed wells, provide for significantly increased penalties for non-compliance with provisions of this Act or its regulations, and require certification for well drillers and installers of well-related equipment.

The Department is in the process of expeditiously proceeding with the staffing of a Well Driller Inspector. Key responsibilities of this position will include: inspection of the construction and sealing of water wells to ensure they are done in accordance with existing legislation and regulation; responding to complaints of water well construction and well sealing problems; and liaison and information exchange with well drilling contractors and other interested parties.

Manitoba Water Stewardship has evaluated the impact of the drilling of non-permitted wells in the Rockwood Sensitive Area, in conjunction with the Department of Conservation. It has concluded that such drilling has not resulted in an increased risk to the area's groundwater. Information available at this time further suggests that it may be possible to reduce the boundary of Rockwood Sensitive Area, reflecting the continued improvement of water quality in the aquifer since implementation of the groundwater remediation plan in 1994.

The Department appreciates the positive contributions of the Auditor General's office, and will continue to develop action plans respecting its remaining recommendations within the context of the Province's broader Water Strategy.

Appendix A

GLOSSARY

Abandoned well	A well that is currently not used and is not intended to be used in the future for water supply purposes. Such a well should be safely and properly sealed. This means that the well has been capped, sealed and grouted so that it is water-tight and that no contaminants may enter the well. This is also know as decommissioning. A well which is not currently in use but may be used for water supply purposes in the future is not considered to be abandoned. Such wells should be properly capped so that no foreign materials may enter the well, but need not be permanently sealed. Unsealed abandoned wells may: act as a conduit for the movement of near-surface contaminants such as bacteria and nutrients into aquifers, interconnect fresh water and saline water aquifers, pose a threat to children or animals who may fall into openings and become trapped, and present a hazard to farm machinery and vehicles.
Accredited Laboratory	A laboratory which has been certified and registered by a national body (CAEAL – Canadian Association of Environmental Accredited Laboratories) to provide testing for certain procedures to ensure that water is safe for consumption. Accreditation is a quality control procedure that provides greater confidence that testing procedures will provide reliable results.
Aesthetic Objective (AO)	Parameters that apply to certain substances or characteristics of drinking water that can affect its acceptance by consumers or interfere with practices for supplying good quality water.
Annular Space	An open space between the well casing and the side of a well. (Also see Well Casing and Well Grout or Grouting).
Aquifer	A saturated, permeable geological formation capable of producing economically useful quantities of groundwater to wells or springs. (Also see Confined Aquifer and Unconfined Aquifer).
Bacteria	A microscopic organism that consists of a single cell. Some cause diseases, others can be a nuisance, while others can aid in pollution control by breaking down organic matter in air and water. (Also see Coliform Bacteria and E. Coli Bacteria).
Boil Water Advisory	An official declaration and public notice made by a Medical Officer of Health to boil water before consuming it or using it for other purposes because the water may contain unsafe levels of contaminants such as bacteria.

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Chlorination	Refers to a common method by which drinking water sources may be made safe from bacteria. Continuous chlorination: the continuous addition of low levels of chlorine to a water supply. Shock chlorination: adding a large amount of chlorine to the water in the well and pumping it through the system. Typically this involves using a prescribed amount of household bleach. The chlorinated water is left in the system long enough to ensure complete disinfection.
Coliform Bacteria	A large group of bacteria, commonly found in topsoil, bodies of water, and animal wastes. Total coliforms: in drinking water, testing the level of total coliforms is used to indicate whether water has been contaminated from an unsanitary source. Fecal coliforms: a sub-group of coliforms found almost exclusively in the intestinal wastes of humans and animals and seldom found elsewhere in the environment. If found in water, they are a good indicator that the water has been contaminated with sewage or other intestinal wastes and may contain disease-causing organisms. Water containing fecal coliforms is unsafe to drink. (Also see E. Coli Bacteria)
Confined Aquifer	A confined, or artesian, aquifer is covered by an aquitard (a confining layer of low permeable soil such as clay). Pressure in a confined aquifer can cause the water level in a well to rise above the top of the aquifer. If the pressure is high enough, the water can rise about the ground surface and flow out of the well (a flowing well). Special steps have to be taken when constructing wells in areas where such flowing wells occur.
Contaminants	Refers to substances such as bacteria, viruses, protozoa, nitrates, chemicals, metals or minerals which at various levels or concentrations in drinking water, as defined by the Guidelines for Canadian Drinking Water Quality, are adverse to human health and therefore not safe for drinking purposes.
Cryptosporidium, Cryptosporidiosis	A small (4-6 micron in diameter) protozoan parasite with a complex life cycle. The species found most common in mammals, Cryptosporidium parvum, has the ability to infect a broad range of hosts. The illness, cryptosporidiosis, consists of watery diarrhea, and occasionally vomiting. Diarrhea typically lasts for 10-14 days in people and cattle, but may last for several months. The disease can be fatal to infants, elderly and immune system compromised individuals.
Driller's Report	See Well Driller's Report.

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E. Coli (Escherichia coliform) Bacteria	Bacteria which occurs naturally in great numbers in the intestines of animals and humans and is a definite indicator of the presence of feces. Their presence is a strong indicator of recent sewage or animal waste contamination and the possible presence of potential pathogenic (disease causing) bacteria. The Canadian Drinking Water Quality Guideline for drinking water is zero E. Coli organisms per 100 mL.
Giardia, Giardiasis	A protozoan parasite sometimes found in mammalian intestines. The sickness, called Giardiasis, nicknamed "beaver fever", can cause diarrhea, abdominal cramps, nausea, vomiting, weight loss and fatigue lasting up to three weeks. It can be carried by humans as well as by certain domestic and wild animals.
Guidelines for Canadian Drinking Water Quality	Published by Health Canada, they are a comprehensive compilation of recommended limits for substances and conditions that affect the quality of drinking water, developed by the Federal-Provincial-Territorial Committee on Drinking Water (see **Appendix C**).
Groundwater	Subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated. Groundwater supplies wells and springs.
Groundwater Sensitive Area	An area in which groundwater sources may be open to the surface because of shallowness and/or being covered by water permeable surface materials such as sand and gravel. These include sources covered by less than 20 feet of glacial till, clay, clayey shale or other non-water-tight materials.
Hydrogeology	The study of the interrelationships of geologic materials and processes with water, especially groundwater.
Interim Maximum Acceptable Concentration (IMAC)	For those substances for which there is insufficient toxicological data to derive a MAC with reasonable certainty, interim values are recommended, taking into account the available health-related data, but employing a larger safety factor to compensate for the larger uncertainties involved.
Maximum Acceptable Concentration (MAC)	These have been established for certain substances that are known or suspected to cause adverse effects on health. MACs have been derived to safeguard health, assuming lifelong consumption of drinking water containing the substance at that concentration.
Milligrams per liter (mg/L)	A unit of the concentration of a constituent in water or wastewater. It represents 0.001 gram of a constituent in 1 liter of water. This measure is equivalent to parts per million (ppm).

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Nitrate/nitrite	Nitrates are chemicals made up of nitrogen and oxygen. They occur naturally in certain foods, preserved meat and in soil and are present in both commercial fertilizers and manure. The presence of nitrates in soil is necessary for plant growth. However, excess nitrates can contaminate water supplies. High nitrate levels in rivers and lakes can increase algae growth, degrade habitat for fish, other aquatic organisms, and wildlife. High nitrate levels in drinking water can cause health problems, particularly for infants and in pregnancy. Boiling water does not reduce nitrates, instead it concentrates them. The Guidelines for Canadian Drinking Water Quality for nitrate in drinking water is 10 mg/L.
Pathogen	A disease causing agent, especially micro-organisms, such as bacteria or viruses.
Pitless Adapter (or Device)	A specially designed underground discharge assembly which provides a frost-free connection and water tight seal where the discharge pipe passes through the wall of the water well casing.
Point Source of Contamination	Refers to contamination from one place that is easy to identify. Point sources of contamination are usually characterized by concentrated pollutants or contamination plumes that are relatively localized.
Potable	Water that is suitable, safe, or prepared for drinking.
Protozoa	A unicellular microorganism that has the means to move around either by cilia or a flagella. Includes giardia and cryptosporidium.
Private Water System	Individual domestic drinking water systems. The water is used for personal or family needs only. The sale of water is not permitted. The drinking water may or may not be chlorinated.
Public Water System	Drinking water distribution systems with 15 or more service connections. The water/service may be sold. The water is chlorinated, as prescribed by Manitoba's Public Health Act, unless exempted by the Minister.
Semi-public Water System	A system which provides drinking water to less than 15 service connections and provides drinking water to the public (for example, to a hotel, school, hospital, or restaurant). The water/service may be sold. The drinking water may or may not be chlorinated.
Total Coliform Bacteria	Bacteria which occur naturally in great numbers in the intestines of animals and humans, in soil and on vegetation. Water is not a natural medium for coliform

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	organisms, so their presence is used as an indicator of water contamination. The Canadian Drinking Water Quality guideline for drinking water is zero total coliform organisms per 100 ml.
Unconfined Aquifer	An unconfined aquifer or water table aquifer is usually the most shallow. The top of an unconfined aquifer is the water table. Lacking an upper confining cap, these aquifers have a high potential for contamination from surface sources.
Viruses	Small microorganisms that are capable of causing a disease. Includes Hepatitis A and Norwalk-type viruses.
Water Quality	Usually refers to the safety of water for drinking purposes. Poor or unsafe water quality refers to water that does not meet the parameter values in the Guidelines for Canadian Drinking Water Quality for any one of a number of potential contaminants including bacteria, chemicals, metals or other properties such as hardness, taste, odor or turbidity (cloudiness of water). Poor water quality cannot alone be detected by smell or taste. For example, high levels of undesirable bacteria may only be detected through testing.
Water Quality Test	The sampling of water from a water source and usually submission to a laboratory to determine whether the water is safe to drink (home test kits can be used to test for the presence of bacteria). Safe drinking water is determined by comparing the water to scientifically established standards called the Canadian Drinking Water Guidelines. Although many substances might be found in drinking water which may be potentially harmful to human health, the most frequently found contaminant of concern, and substance most recommended for regular testing is bacteria (total coliforms and E. coli).
Water Treatment	Methods that may be used to control the quality of water to ensure that it is safe for human use, including drinking. Types of water treatment include chlorination, filtration, ultra-violet, ozonation, and reverse osmosis.
Water Well	An artificial excavation constructed for the purpose of withdrawing water from an aquifer.
Well Cap	A cover which has been placed on the top of a well. Ideally a well cap should be secure (locked) and prevent leakages back into the well.
Well Casing	The liner inside a well which helps ensure the integrity of the well structure (to prevent collapse of the hole structure) and protects the quality of water drawn from the

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	well. A well casing may be constructed to different depths and consist of varying material types. Examples include metals such as steel (more common in older, larger diameter wells), or plastic/PVC pipe (more common in newer constructed drilled/small diameter wells).
Well Construction	The process or act of developing and installing a new well or modifying the physical properties of an existing well to improve its performance or safety. Design considerations when developing a well include the well's depth, the type of well to construct, the casing material and its size, the intake design, seal, and monitoring and preventive maintenance provisions.
Well Driller's Report	A log kept at the time of drilling showing the depth, thickness, character of the different soil/rock penetrated, location and type of water-bearing soil/rock and depth, size, and character of the casing/screen installed. Also known as a Well Log.
Well Grout or Grouting	Well drilling leaves a gap (annular space) between the drill hole and the outside of the casing. This gap must be sealed. Without this seal, the outside of the casing acts as a path for surface water and contaminants to enter the aquifer. The materials used for the annular seal are usually cement grout, concrete or bentonite. Grouting is also done when sealing an abandoned well.
Well Head Protection	Protecting the area around a water well from sources of potential groundwater contamination.
Well Inspection	A process where a knowledgeable individual such as a well driller or engineer visually inspects various aspects of a well to ensure its overall integrity so that it can provide a dependable safe supply of water. The inspection may include water quantity and water quality testing as well.
Well Log	See Well Driller's Report.
Well Pit	A cribbed pit constructed below ground surface for the purpose of housing a well. The pit may be constructed of stone, brick, concrete, wood, metal culvert or other material. The purpose of a well pit is to provide for connections to be made below the frost line to protect the lines from freezing. Due to their high susceptibility to contamination, the use of a well pit is not recommended. A pitless adapter should be used instead. In some jurisdictions well pits are prohibited in new well construction.

Appendix B

PROVINCIAL WATER RELATED LEGISLATION

WATER RELATED ACTS

The Conservation Districts Act

This Act was enacted in 1987. There have been no recent significant amendments to the Act.

The purpose of The Conservation Districts Act is to provide for the conservation, control and prudent use of resources through the establishment of conservation districts and to protect the correlative rights of owners. A municipality or group of municipalities may form a Conservation District. Each management plan developed by the Conservation District Board must comply with The Water Rights Act, The Land Rehabilitation Act and The Planning Act. Programs may address soil conservation, water management and storage, and land drainage.

The Drinking Water Safety Act

The Drinking Water Safety Act was enacted in 2002 and proclaimed in force January 30, 2004 with the exception of section 3, sections 7 through 10, sections 20 through 25, and section 30. Until regulations are put in place, the Department of Water Stewardship operates under the provisions of the Public Health Act and its associated regulations related to drinking water and protection.

The Act formally establishes the Office of Drinking Water and sets out a framework for protection of drinking water including: allowing standards for drinking water quality; requiring permits for construction or alteration of public or semi-public water systems; requiring licensing of operators of public and semi-public water systems; and setting out disinfection, testing and reporting requirements for drinking water systems. The Act also provides a framework for issuing drinking water safety orders and boil water advisories.

The Dyking Authority Act

This Act was enacted in 1987. There have been no recent significant amendments to the Act.

The Dyking Authority Act gives the City of Winnipeg authority and control over dykes and pumping stations constructed for the protection of property during periods of flood in the Red River, Assiniboine River or Seine River. The Dyking Commissioner who is a member of the Water Branch of Manitoba Water Stewardship provides supervision of administration of the Act.

The Manitoba Floodway Authority Act (formerly The Floodway Authority Act)

The Floodway Authority Act, subsequently renamed The Manitoba Floodway Authority Act, was enacted in June 2004 and proclaimed in force November 1, 2004.

The Act establishes the Manitoba Floodway Authority as a corporation of the Crown. The Manitoba Floodway Authority is responsible for the expansion and maintenance of the Red River Floodway.

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The Ground Water and Water Well Act

Enacted in 1987, there have been no significant amendments to the Act.

The Act provides for the licensing of all persons engaged in the business of drilling water wells. The Act also provides for the licensing of equipment used in the drilling of well and for reporting of well drilling activities by licensed well drillers.

The Manitoba Habitat Heritage Act

Establishment of The Manitoba Habitat Heritage Corporation is provided for in The Manitoba Habitat Heritage Act of 1985.

The Corporation is responsible for conservation, restoration and enhancement of fish and wildlife habitat and populations on Crown land and private land by agreement with the owner.

The Lake of the Woods Control Board Act

The Lake of the Woods Control Board Act was enacted in 1987.

This Act established a four member board to regulate Lake of the Woods and Lac Seul so as to provide the most dependable flow and the most advantageous and beneficial use of the Winnipeg River and the English River.

The Red River Floodway Act

The Red River Floodway Act was enacted in June 2004 and proclaimed in force April 20, 2005.

The Act establishes a government compensation program for property damage and economic loss that may result if springtime operation of the Red River Floodway causes unnaturally high water levels in and around the Red River. The program supplements compensation available under other government programs and takes the place of court action to recover compensation for any damage or loss covered by the program.

In the event of a spring flood that is so large that it exceeds or threatens to exceed the Floodway's capacity, the government has the right to flood land, and is protected from court action to prevent it from operating the Floodway.

The Water Commission Act

Enacted in 1987, The Water Commission Act establishes a five member commission to study projects, problems and schemes referred by the Minister. The Act is to be repealed following proclamation of The Water Protection Act.

The Water Power Act

Jurisdiction over water power and any lands required for its creation, development or protection is addressed in The Water Power Act of 1987.

Ministerial approval is required to divert, use or store water for power purposes and for activities that impact water within a water power reserve.

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The Water Protection Act

The Water Protection Act was enacted in June 2005. It will come into force on a day to be fixed by proclamation.

The Act provides a legislative framework for water protection at the source, whether it is used for drinking or not and to recognize the importance of preserving our water resources and aquatic ecosystems. It includes provisions:

- to allow water quality standards, objectives and guidelines to be developed;
- to establish waster quality management zones and to regulate activities within those zones;
- to prohibit and otherwise regulate harmful non-native species;
- to allow water conservation programs to be established;
- to require the preparation of watershed management plans, and for their adoption in local development plans; and
- to allow for declaration of serious water shortages, and for the taking of action to address such shortages.

The Act also establishes a new advisory body, the Manitoba Water Council, and dissolves the Manitoba Water Commission by repealing The Water Commission Act. In addition, the Act establishes the Water Stewardship Fund to support projects relating to water management and water quality.

The Water Resources Administration Act

Enacted in 1987, the only major amendment occurred in 2000, with the incorporation of new standards for building within a flood area.

The Water Resources Administration Act establishes the Lieutenant Governor in Council's authority to designate any water control work, natural water channel or lake as a provincial waterway. The Minister is authorized to manage and administer all those matters that relate to the construction or operation of water control works and matters dealt with under The Dyking Authority Act, The Ground Water and Water Well Act, The Water Power Act, and The Water Rights Act.

This Act also addresses designated flood areas. Within designated flood areas, it makes the requirement for a permit to be issued that authorizes the occupation and construction of buildings, and states that the permit can contain terms and conditions that are consistent with the "Designated Flood Area Regulation".

The Water Resources Conservation and Protection Act

This Act, enacted in 2000, prohibits the transfer of water between Manitoba water basins or removal of water from them. Exceptions include water that is: in containers of 25 liters or less; needed for the carriage of people, animals, food or products in vehicles, aircraft or water-vessels; or used for short-term safety, security or humanitarian purposes.

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The Water Rights Act

The first Water Rights Act was enacted in 1930 and subsequently rewritten in 1954 and 1972. The current Act was enacted in 1988. The Water Rights Act has undergone only minor amendments since that time.

The Act vests ownership of water in the Crown and requires licences for diversion and use of water for all but domestic withdrawals. Domestic use is defined as water obtained from a source other than a municipal or community water distribution system at a rate of not more than 25,000 litres per day for household and sanitary purposes, for the watering of lawns and gardens and for the watering of livestock and poultry.

The Act applies equally to groundwater and surface water. Water is allocated on essentially a first come - first serve basis. The Act also identifies priorities of use: 1) domestic, 2) municipal, 3) agriculture, 4) industrial, 5) other purposes. Licences are issued for up to a maximum term of 20 years, after which the holder of the licence may apply for renewal.

The Manitoba Water Services Board Act

The Manitoba Water Services Board Act was enacted in 1987. The Act, amended in 1997, provides for the establishment of The Manitoba Water Services Board. The Board's objective is to provide for the development and maintenance of water and sewage treatment facilities and the related infrastructure in agricultural and rural areas. Services are delivered through municipalities or water districts.

The Water Supply Commission Act

This Act was enacted in 1988. There have been no recent amendments.

The Water Supply Commission Act provides for the establishment of a water commission area, known as a water district, and a water commission for each district. The Commission is responsible for preparing schemes for supplying the water commission area with an adequate and reliable permanent supply of water relative to the control and use of the water resources available. Currently there is the Souris River Water Commission and the Lower Red River Valley Water Commission. Both act in an advisory capacity only.

ACTS WITH WATER RELATED PROVISIONS

The City of Winnipeg Charter Act

Enacted in 2002 and in force January 1, 2003, the Act stipulates the power and authority under which the City of Winnipeg is governed. With regards to water related issues, the city has full authority concerning protection against floods, construction and maintenance of drains and watercourses.

The Crown Lands Act

This Act was enacted in 1987. In 1999 Nunavut was specifically addressed in the Act.

Crown lands are managed and administered under The Crown Lands Act. The Act provides for the sale, lease permitting, licensing, enforcement and reservations for specific departmental and government programs. Out of every disposition of Crown land there is reserved to the Crown, in case the land extends to the shores of any navigable water or

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an inlet thereof or to the boundary line between Canada and the United States, a strip of land one and one-half chains [approximately 30 metres] in width measured from ordinary high water mark or from the boundary line. The Department of Agriculture, Food and Rural Initiatives administers agricultural disposition of Crown lands.

The Dangerous Goods Handling and Transportation Act

Since its enactment in 1987 periodic amendments have been made to this Act, most notably in 1996 to strengthen the review and assessment process for licence applications to operate a hazardous waste disposal facility and in 2002 requiring the development and submission of security plans regarding the dangerous goods or contaminants being handled.

The Dangerous Goods Handling and Transportation Act establishes controls over all aspects of dangerous goods affecting the environment and/or public health with an emphasis on standards for handling, disposal of hazardous wastes, environmental accident response and highway transportation.

The Department of Agriculture, Food and Rural Initiatives Act

Enacted in 1987, The Department of Agriculture and Food Act was amended to include the functions relating to Rural and Northern Community Economic Development Services which were moved from the former Department of Intergovernmental Affairs as part of the government reorganization in November 2003.

The Act allows the Department of Agriculture, Food and Rural Initiatives to institute and carry out programs, projects and undertakings relating to any aspect of agriculture or rural communities. The Departments of Agriculture, Food and Rural Initiatives and Conservation cooperate in matters of land drainage, irrigation and rural water supplies.

The Endangered Species Act

This Act was enacted in 1990. There have been no recent amendments.

The Endangered Species Act ensures the protection and enhances the survival of endangered and threatened species and their habitat. The Act prevents the destruction, disturbance or interference of their habitat and the damage, disturbance, obstruction or removal of a natural resource on which an endangered or threatened species depends for its life and propagation.

The Environment Act

Since enacted in 1987 there have been periodic amendments to the Act. In 2002 the Act was amended to give authority to the Minister of Health to issue a health emergency because of mosquitoes capable of transmitting diseases and order a municipality to take certain measures.

The intent of The Environment Act is to provide for: environmental assessment of projects which are likely to have significant effects on the environment; development and implementation of standards and objectives for environmental quality; and development of environmental management strategies and policies for the protection, maintenance, enhancement and restoration of environmental quality. There are three classes of environmental assessments, dependent on the size of the project, each with their own set of licensing criteria.

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Under the Act there are a number of regulations which affect water including:

- Livestock Manure and Mortalities Management Regulation;
- Onsite Wastewater Management Systems Regulation;
- Pesticides Regulation;
- Rockwood Sensitive Area Regulation; and
- Water and Wastewater Facility Operators Regulation.

The Heritage Resources Act

Under The Heritage Resources Act of 1986, sites considered of heritage significance may be designated either as a provincial or municipal heritage site and are protected. In addition, where the Minister responsible for the Act has reason to believe that any activity or project may adversely affect heritage resources, the Minister may require the proponent to carry out a heritage resource impact assessment before proceeding.

The Highways and Transportation Act

Enacted in 1987, The Highways and Transportation Act allows the Department of Transportation and Government Services, with consent of the Minister of Conservation, to construct drains for draining water from departmental roads.

The Municipal Act

The present Municipal Act was enacted in 1996. Over the past few years several amendments have been adopted. In 1997 amendments primarily dealt with Board member responsibilities. Amendments in 1998 addressed annexation of land, amalgamation of municipalities, expenditures/budgets, and formally set out municipal jurisdiction over drains. In 1999 auctioning of property was addressed.

The Municipal Act provides for the formation of a municipality, its council, and the jurisdiction under which it governs. With respect to water, a municipality may pass by-laws regarding drains and drainage on private or public property. Municipalities are responsible for maintaining municipal drains.

The Municipal Board Act

The Municipal Board Act of 1987 establishes a Board that has the authority to hear appeals under The Water Rights Act and The Municipal Act.

The Planning Act

Enacted in 1987, the Act underwent extensive changes in 1998 specifically in the areas of development plan alterations, special planning areas, development permits and the establishment of the Inter-Departmental Planning Board. Further amendments were made in 2000 regarding mandatory technical reviews for livestock operations over 400 animal units in size and improved public notification and access to review committee reports.

The current Act, in force until repealed and replaced by a new Planning Act provides for the development of Provincial Land Use Policies, establishment of special planning areas and planning districts and provides for the development of basic planning statements, development plans and zoning by-laws. Special planning areas are designated for the protection and conservation of natural resources such as lakes, rivers and shore lands.

Appendix B
(cont'd.)

A new Planning Act which was enacted in June 2005 comes into force on January 1, 2006. The intent of the new legislation is to streamline procedures for approving development plan by-laws, zoning by-laws and applications for variances and use. It also enhances the provisions dealing with livestock operations by requiring livestock operation policies to be included in the development plans of the municipality or planning district, establishing a standard review and notification process. The Act also specifies the requirements for large-scale livestock operations involving 300 or more animal units as well as those for small-scale livestock operations with fewer that 300 animal units.

The Provincial Parks Act

Enacted in 1993, The Provincial Parks Act provides the authority to establish lands as provincial parks. In accordance with parks classifications and land use categories, the purpose may be to conserve ecosystems and maintain biodiversity. Regulations have been developed respecting the protection and use of water, interference with drainage patterns and pollution of water.

The Public Health Act

The Public Health Act was enacted in 1987. Under the Act, regulations were developed aimed at restricting certain activities to protect surface and groundwater resources from contamination as well as establishing approval requirements for construction or modification of water supply or wastewater distribution systems. The Act was amended in 2002 to enhance the Province's security and public health emergency response.

The Sustainable Development Act

Assented to in 1997, the Act was amended in 2000 to address other government policies, legislation, regulations and programs for consistency with the Principles and Guidelines of Sustainable Development.

Sustainable development will be implemented in the provincial public sector and promoted in the private industry and in society through the framework created in The Sustainable Development Act. The framework created in the Act provides for: the Manitoba Round Table for Sustainable Development, Sustainable Development Principles and Guidelines, a Sustainable Development Strategy, Sustainability Indicators and Reporting, a Code of Practice and the continuation of the Sustainable Development Innovation Fund.

The Wildlife Act

Enacted in 1987, the Act was amended in 2000 to provide for the regulation of the captive hunting of animals. "Exotic wildlife" are specifically addressed in the Act.

The Wildlife Act authorizes the Province of Manitoba to: designate special areas for the better management, conservation and enhancement of the wildlife resource, simulate what constitutes an offence, and determine licensing, permit and enforcement provisions. Authorization is required, in the form of a license or permit, to destroy or damage habitat on Crown lands or to willfully destroy the nest or eggs of any game bird or bird listed in the schedule.

SUMMARY OF GUIDELINES FOR CANADIAN DRINKING WATER QUALITY

Appendix C

Summary of Guidelines for Canadian Drinking Water Quality

Prepared by the
Federal–Provincial–Territorial Committee on Drinking Water
of the
Federal–Provincial–Territorial Committee
on Health and the Environment

April 2004

The *Guidelines for Canadian Drinking Water Quality* are published by Health Canada. In order to keep interested parties informed of changes to the Guidelines between publication of new editions, this summary table is updated and published every spring on Health Canada's website (www.hc-sc.gc.ca/waterquality). The April 2004 "Summary of Guidelines for Canadian Drinking Water Quality" supercedes all previous versions, including that contained in the published booklet.

Membership of the Federal–Provincial–Territorial Committee on Drinking Water and Secretariat

Provincial and Territorial Representatives		
Alberta	Department of Environment	Mr. Karu Chinniah
British Columbia	Ministry of Health Services	Mr. Barry Boettger
Manitoba	Department of Water Stewardship	Mr. Don Rocan
New Brunswick	Department of Health and Wellness	Mr. Ivan Brophy
Newfoundland and Labrador	Department of Environment and Conservation	Mr. Martin Goebel
Northwest Territories	Department of Health and Social Services	Mr. Duane Fleming
Nova Scotia	Department of Environment and Labour	Ms. Judy MacDonald
Nunavut Territory	Department of Health and Social Services	Mr. Bruce Trotter
Ontario	Ministry of the Environment	Ms. Patricia Lachmaniuk
Prince Edward Island	Department of Environment and Energy	Mr. George Somers
Québec	Ministère de l'Environnement	Ms. Hélène Tremblay
Saskatchewan	Department of the Environment	Mr. Sam Ferris
Yukon Territory	Department of Health and Social Services	Ms. Patricia Brooks
Federal Representatives		
Health Canada		Dr. John Cooper
Environment Canada		Mr. Doug Spry
Liaison Officers		
Dr. Jim Popplow	Federal–Provincial–Territorial Committee on Health and the Environment	
Mr. Tim Macaulay	Canadian Advisory Council on Plumbing	
Committee Secretary		
Health Canada (Water Quality and Health Bureau, Safe Environments Programme, Healthy Environments and Consumer Safety Branch)		Mr. David Green

Appendix C
(cont'd.)

New, Revised and Reaffirmed Guidelines

New, revised and reaffirmed guidelines for chemical, physical and microbiological parameters are presented in Table 1.

Table 1
New, Revised and Reaffirmed Guidelines* for Chemical, Physical and Microbiological Parameters since the Publication of the Sixth Edition of the *Guidelines for Canadian Drinking Water Quality*

Parameter	Guideline (mg/L)	Previous guideline (mg/L)	Year approved
Chemical and Physical Parameters			
Aluminum	0.1**	None	1998
Antimony	IMAC 0.006	None	1997
Bromate	IMAC 0.01	None	1998
Cyanobacterial toxins (as Microcystin-LR)	0.0015	None	2002
Fluoride	MAC 1.5	MAC 1.5	1996
Formaldehyde	None required – see Table 3	None	1997
Uranium	IMAC 0.02	MAC 0.1	1999
Microbiological Parameters			
Bacteria	***		Ongoing
Protozoa	***		Ongoing
Viruses	***		Ongoing

* MAC = maximum acceptable concentration; IMAC = interim maximum acceptable concentration.
** Refer to note 1 in Table 2.
*** Refer to section on Summary of Guidelines for Microbiological Parameters.

Appendix C
(cont'd.)

Table 2
Consultation Guidelines

Parameter	**Proposed Guideline* (mg/L)**		**Consultation Concludes**
	MAC	AO	
Arsenic	0.005		**Fall/Winter 2004**
Bacteriological (4 documents)			Jan. 13, 2005
Bromodichloromethane (BDCM)**	0.016		**Jan. 7, 2005**
Chloral hydrate	NGP		Fall/Winter 2004
Chlorite **Chlorate**	1.0 1.0		**Fall/Winter 2004**
Methyl *tertiary*-butyl ether (MTBE)		0.015	Fall/Winter 2004
Haloacetic Acids (HAAs)			**TBD**
Trihalomethanes (THMs)	0.1		Jan. 7, 2005
Trichloroethylene (TCE)	0.005		**April 5, 2004**

* MAC = Maximum Acceptable Concentration;
AO = Aesthetic Objective;
NGP = No Guideline Proposed.
** Refer to Trihalomethane document.

Summary of Guidelines for Microbiological Parameters

Bacteria (Under Review)

The maximum acceptable concentration (MAC) for bacteriological quality of public, semi-public, and private drinking water systems is no coliforms detectable per 100 mL. However, because coliforms are not uniformly distributed in water and are subject to considerable variation in public health significance, drinking water that fulfills the following conditions is considered to conform to this MAC:

Public Drinking Water Supply Systems

1. No sample should contain *Escherichia coli*. *E. coli* indicates recent faecal contamination and the possible presence of enteric pathogens that may adversly affect human health. If *E. coli* is confirmed, the appropriate agencies should be notified, a boil water advisory should be issued, and corrective actions taken.

2. No consecutive samples from the same site or not more than 10% of samples from the distribution system in a given calendar month should show the presence of total coliform bacteria. The ability of total coliforms to indicate the presence of faecal pollution is less reliable than *E. coli*. However, this group of bacteria is a good indicator of quality control. The presence of total coliforms does not necessarily require the issuance of a boil water advisory but corrective actions should be taken.

Semi-public and Private Drinking Water Supply Systems

1. No sample should contain *E. coli*. As stated above, the presence of *E. coli* indicates faecal contamination and the possible presence of enteric pathogens; therefore the water is unsafe to drink. If *E. coli* is detected, a boil water advisory should be issued and corrective actions taken.

2. No sample should contain total coliform bacteria. In non-disinfected well water, the presence of total coliform bacteria in the absence of *E. coli* indicates the well is prone to surface water infiltration and therefore at risk of faecal contamination. In disinfected water systems, the presence of total coliform bacteria indicates a failure in the disinfection process. In both disinfected and non-disinfected systems, total coliform detection may also indicate the presence of biofilm in the well or plumbing system. The degree of response to the presence of total coliform bacteria, in the absence of *E. coli*, may be site specific and can vary between jurisdictions.

Protozoa (Under Review)

Numerical guidelines for the protozoa *Giardia* and *Cryptosporidium* are not proposed at this time. Routine methods available for the detection of protozoan cysts and oocysts suffer from low recovery rates and do not provide any information on their viability or human infectivity. Nevertheless, until better monitoring data and information on the viability and infectivity of cysts and oocysts present in drinking water are available, measures to reduce the risk of illness as much as possible should be implemented. If viable, human-infectious cysts or oocysts are present or suspected to be present in source waters or if *Giardia* or *Cryptosporidium* has been responsible for past waterborne outbreaks in a community, a treatment regime and a watershed or wellhead protection plan (where feasible) or other measures known to reduce the risk of illness should be implemented.

Viruses (Under Review)

Numerical guidelines for human enteric viruses are not proposed at this time. There are more than 120 types of human enteric viruses, many of which are non-culturable. Testing is complicated, expensive, not available for all viruses, and beyond the capabilities of most laboratories involved in routine water quality monitoring. The best means of safeguarding against the presence of human enteric viruses are based upon the application of adequate treatment and the absence of faecal indicator organisms, such as *Escherichia coli*.

Boil Water Advisories

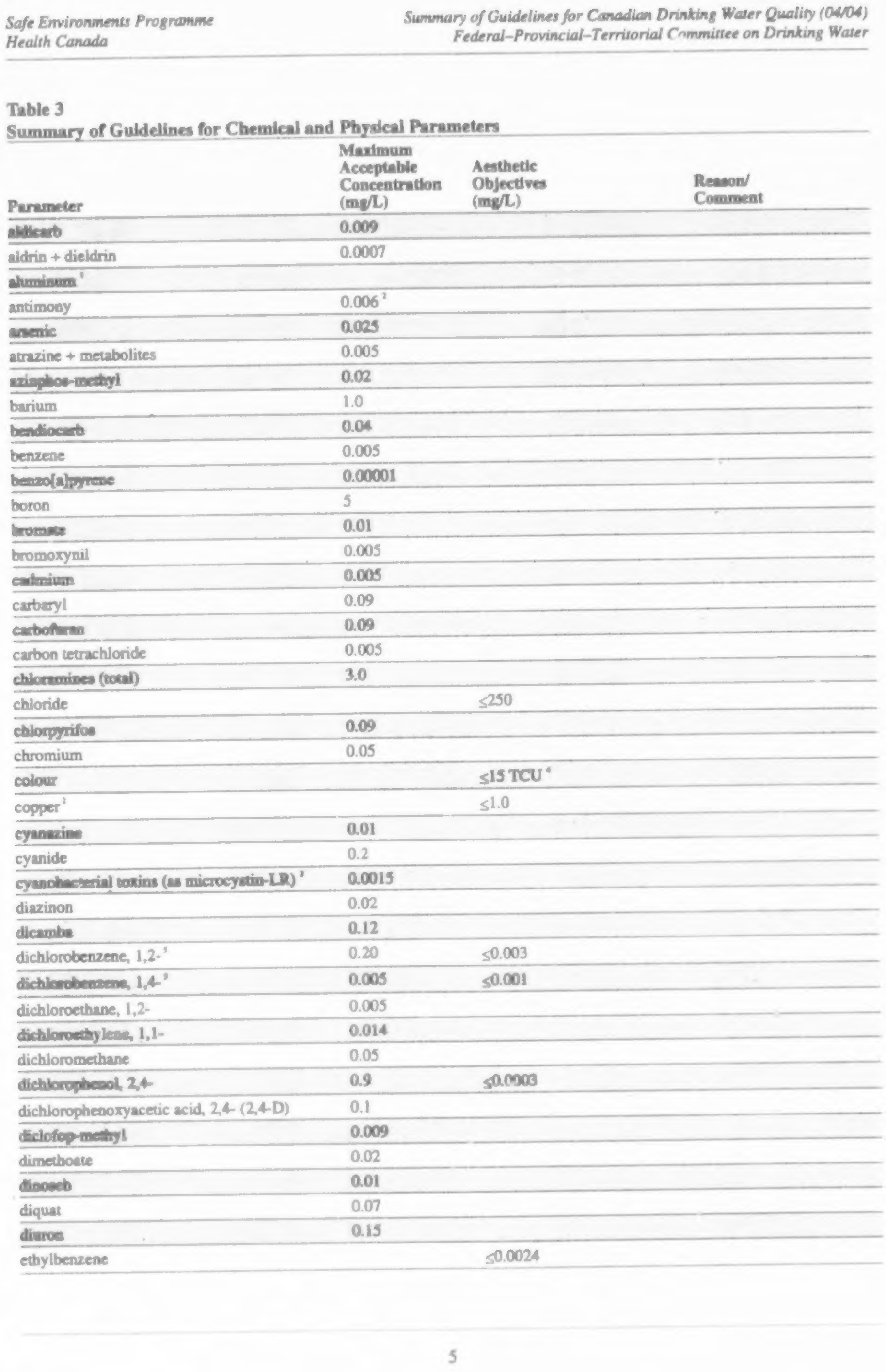
General guidance on the issuing and rescinding of boil water advisories is provided. In the event of an advisory, a rolling boil for 1 minute is considered adequate.

Summary of Guidelines for Chemical and Physical Parameters

Parameters with Guidelines

Guidelines for all chemical and physical parameters, including all new, revised and reaffirmed maximum acceptable concentrations (MACs), interim maximum acceptable concentrations (IMACs) and aesthetic objectives (AOs), are listed in Table 3. For more information on the drinking water guideline for any particular compound, please refer to the Supporting Documentation for the parameter of concern.

Appendix C
(cont'd.)



Safe Environments Programme
Health Canada

Summary of Guidelines for Canadian Drinking Water Quality (04/04)
Federal–Provincial–Territorial Committee on Drinking Water

Table 3
Summary of Guidelines for Chemical and Physical Parameters

Parameter	Maximum Acceptable Concentration (mg/L)	Aesthetic Objectives (mg/L)	Reason/ Comment
aldicarb	**0.009**		
aldrin + dieldrin	0.0007		
aluminum [1]			
antimony	0.006 [2]		
arsenic	**0.025**		
atrazine + metabolites	0.005		
azinphos-methyl	**0.02**		
barium	1.0		
bendiocarb	**0.04**		
benzene	0.005		
benzo[a]pyrene	**0.00001**		
boron	5		
bromate	**0.01**		
bromoxynil	0.005		
cadmium	**0.005**		
carbaryl	0.09		
carbofuran	**0.09**		
carbon tetrachloride	0.005		
chloramines (total)	**3.0**		
chloride		≤250	
chlorpyrifos	**0.09**		
chromium	0.05		
colour		**≤15 TCU** [4]	
copper [2]		≤1.0	
cyanazine	**0.01**		
cyanide	0.2		
cyanobacterial toxins (as microcystin-LR) [3]	**0.0015**		
diazinon	0.02		
dicamba	**0.12**		
dichlorobenzene, 1,2- [5]	0.20	≤0.003	
dichlorobenzene, 1,4- [5]	**0.005**	**≤0.001**	
dichloroethane, 1,2-	0.005		
dichloroethylene, 1,1-	**0.014**		
dichloromethane	0.05		
dichlorophenol, 2,4-	**0.9**	**≤0.0003**	
dichlorophenoxyacetic acid, 2,4- (2,4-D)	0.1		
diclofop-methyl	**0.009**		
dimethoate	0.02		
dinoseb	**0.01**		
diquat	0.07		
diuron	**0.15**		
ethylbenzene		≤0.0024	

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Appendix C

(cont'd.)

Summary of Guidelines for Canadian Drinking Water Quality (04/04)
Federal–Provincial–Territorial Committee on Drinking Water

Safe Environments Programme
Health Canada

Parameter	Maximum Acceptable Concentration (mg/L)	Aesthetic Objectives (mg/L)	Reason/ Comment
fluoride [6]	1.5		
glyphosate	0.28		
iron		≤0.3	
lead [7]	0.010		
malathion	0.19		
manganese		≤0.05	
mercury	0.001		
methoxychlor	0.9		
metolachlor	0.05		
metribuzin	0.08		
monochlorobenzene	0.08	≤0.03	
nitrate [7]	45		
nitrilotriacetic acid (NTA)	0.4		
odour		Inoffensive	
paraquat (as dichloride)	0.01 [8]		
parathion	0.05		
pentachlorophenol	0.06	≤0.030	
pH		6.5–8.5 [9]	
phorate	0.002		
picloram	0.19		
selenium	0.01		
simazine	0.01		
sodium [10]		≤200	
sulphate [11]		≤500	
sulphide (as H_2S)		≤0.05	
taste		Inoffensive	
temperature		≤15°C	
terbufos	0.001		
tetrachloroethylene	0.03		
tetrachlorophenol, 2,3,4,6-	0.1	≤0.001	
toluene		≤0.024	
total dissolved solids (TDS)		≤500	
trichloroethylene	0.05		
trichlorophenol, 2,4,6-	0.005	≤0.002	
trifluralin	0.045		
trihalomethanes (total) [12]	0.1		
turbidity	1 NTU [13]	≤5 NTU [14]	
uranium	0.02		
vinyl chloride	0.002		
xylenes (total)		≤0.3	
zinc [3]		≤5.0	

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Notes:

1. A health-based guideline for aluminum in drinking water has not been established. However, water treatment plants using aluminum-based coagulants should optimize their operations to reduce residual aluminum levels in treated water to the lowest extent possible as a precautionary measure. *Operational guidance values* of less than 100 μg/L total aluminum for conventional treatment plants and less than 200 μg/L total aluminum for other types of treatment systems are recommended. Any attempt to minimize aluminum residuals must not compromise the effectiveness of disinfection processes or interfere with the removal of disinfection by-product precursors.
2. Because first-drawn water may contain higher concentrations of metals than are found in running water after flushing, faucets should be thoroughly flushed before water is taken for consumption or analysis.
3. The guideline is considered protective of human health against exposure to other microcystins (total microcystins) that may also be present.
4. TCU = true colour unit.
5. In cases where total dichlorobenzenes are measured and concentrations exceed the most stringent value (0.005 mg/L), the concentrations of the individual isomers should be established.
6. It is recommended, however, that the concentration of fluoride be adjusted to 0.8–1.0 mg/L, which is the optimum range for the control of dental caries.
7. Equivalent to 10 mg/L as nitrate–nitrogen. Where nitrate and nitrite are determined separately, levels of nitrite should not exceed 3.2 mg/L.
8. Equivalent to 0.007 mg/L for paraquat ion.
9. No units.
10. It is recommended that sodium be included in routine monitoring programmes, as levels may be of interest to authorities who wish to prescribe sodium-restricted diets for their patients.
11. There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.
12. The IMAC for trihalomethanes is expressed as a running annual average. It is based on the risk associated with chloroform, the trihalomethane most often present and in greatest concentration in drinking water. The guideline is designated as interim until such time as the risks from other disinfection by-products are ascertained. The preferred method of controlling disinfection by-products is precursor removal; however, any method of control employed must not compromise the effectiveness of water disinfection.
13. NTU = nephelometric turbidity unit.
14. At the point of consumption.

Parameters without Guidelines

Since 1978, some chemical and physical parameters have been identified as not requiring a numerical guideline. Table 4 lists these parameters.

The reasons for parameters having no numerical guideline include the following:

- currently available data indicate no health risk or aesthetic problem (e.g., calcium);
- data indicate the compound, which may be harmful, is not registered for use in Canada (e.g., 2,4,5-TP) or is not likely to occur in drinking water at levels that present a health risk (e.g., silver); or
- the parameter is composed of several compounds for which individual guidelines may be required (e.g., pesticides [total]).

Appendix C
(cont'd.)

Table 4
Summary List of Parameters without Guidelines

Parameter	Parameter
ammonia	mirex
asbestos	phenols
calcium	phthalic acid esters (PAE)
chlordane (total isomers)	polycyclic aromatic hydrocarbons (PAH) [2]
dichlorodiphenyltrichloroethane (DDT) + metabolites	radon
endrin	resin acids
formaldehyde	silver
gasoline	tannin
hardness [1]	temephos
heptachlor + heptachlor epoxide	total organic carbon
lignin	toxaphene
lindane	triallate
magnesium	trichlorophenoxyacetic acid, 2,4,5- (2,4,5-T)
methyl-parathion	trichlorophenoxypropionic acid, 2,4,5- (2,4,5-TP)

Notes:

1. Public acceptance of hardness varies considerably. Generally, hardness levels between 80 and 100 mg/L (as $CaCO_3$) are considered acceptable; levels greater than 200 mg/L are considered poor but can be tolerated; those in excess of 500 mg/L are normally considered unacceptable. Where water is softened by sodium ion exchange, it is recommended that a separate, unsoftened supply be retained for culinary and drinking purposes.
2. Other than benzo[a]pyrene.

Summary of Guidelines for Radiological Parameters

In setting dose guidelines for radionuclides in drinking water, it is recognized that water consumption contributes only a portion of the total radiation dose and that some radionuclides present are natural in origin and therefore cannot be excluded. Consequently, maximum acceptable concentrations (MACs) for radionuclides in drinking water have been derived based on a committed effective dose of 0.1 mSv* from one year's consumption of drinking water. This dose represents less than 5% of the average annual dose attributable to natural background radiation.

To facilitate the monitoring of radionuclides in drinking water, the reference level of dose is expressed as an activity concentration, which can be derived for each radionuclide from published radiological data. The National Radiological Protection Board has calculated dose conversion factors (DCFs) for radionuclides based on metabolic and dosimetric models for adults and children. Each DCF provides an estimate of the 50-year committed effective dose resulting from a single intake of 1 Bq** of a given radionuclide.

The MACs of radionuclides in public water supplies are derived from adult DCFs, assuming a daily water intake of 2 L, or 730 L/year, and a maximum committed effective dose of 0.1 mSv, or 10% of the International Commission on Radiological Protection limit on public exposure:

$$\text{MAC (Bq/L)} = \frac{1 \times 10^{-4}\ \text{(Sv/year)}}{730\ \text{(L/year)} \times \text{DCF (Sv/Bq)}}$$

* Sievert (Sv) is the unit of radiation dose. It replaces the old unit, rem (1 rem = 0.01 Sv).
** Becquerel (Bq) is the unit of activity of a radioactive substance, or the rate at which transformations occur in the substance. One becquerel is equal to one transformation per second and is approximately equal to 27 picocuries (pCi).

Appendix C
(cont'd.)

When two or more radionuclides are found in drinking water, the following relationship should be satisfied:

$$\frac{C_1}{MAC_1} + \frac{c_2}{MAC_2} + \ldots \frac{c_i}{MAC_i} \leq 1$$

where c_i and MAC_i are the observed and maximum acceptable concentrations, respectively, for each contributing radionuclide.

MACs for radionuclides that should be monitored in water samples are listed in Table 5. If a sample is analysed by gamma-spectroscopy, additional screening for radionuclides that may be present under certain conditions can be performed. MACs for these radionuclides are given in Table 6. MACs for a number of additional radionuclides, both natural and artificial, can be found in the sixth edition of the guidelines booklet.

Water samples may be initially screened for radioactivity using techniques for gross alpha and gross beta activity determinations. Compliance with the guidelines may be inferred if the measurements for gross alpha and gross beta activity are less than 0.1 Bq/L and 1 Bq/L, respectively, as these are lower than the strictest MACs. Sampling and analyses should be carried out often enough to accurately characterize the annual exposure. If the source of the activity is known, or expected, to be changing rapidly with time, then the sampling frequency should reflect this factor. If there is no reason to suppose that the source varies with time, then the sampling may be done annually. If measured concentrations are consistent and well below the reference levels, this would be an argument for reducing the sampling frequency. On the other hand, the sampling frequency should be maintained, or even increased, if concentrations are approaching the reference levels. In such a case, the specific radionuclides should be identified and individual activity concentrations measured.

Table 5
Primary List of Radionuclides – Maximum Acceptable Concentrations

Radionuclide		**Half-life $t_{1/2}$**	**DCF (Sv/Bq)**	**MAC (Bq/L)**
Natural Radionuclides				
Lead-210	^{210}Pb	22.3 years	1.3×10^{-6}	0.1
Radium-224	^{224}Ra	3.66 days	8.0×10^{-8}	2
Radium-226	^{226}Ra	1600 years	2.2×10^{-7}	0.6
Radium-228	^{228}Ra	5.76 years	2.7×10^{-7}	0.5
Thorium-228	^{228}Th	1.91 years	6.7×10^{-8}	2
Thorium-230	^{230}Th	7.54×10^{4} years	3.5×10^{-7}	0.4
Thorium-232	^{232}Th	1.40×10^{10} years	1.8×10^{-6}	0.1
Thorium-234	^{234}Th	24.1 days	5.7×10^{-9}	20
Uranium-234	^{234}U	2.45×10^{5} years	3.9×10^{-8}	4*
Uranium-235	^{235}U	7.04×10^{8} years	3.8×10^{-8}	4*
Uranium-238	^{238}U	4.47×10^{9} years	3.6×10^{-8}	4*
Artificial Radionuclides				
Cesium-134	^{134}Cs	2.07 years	1.9×10^{-8}	7
Cesium-137	^{137}Cs	30.2 years	1.3×10^{-8}	10
Iodine-125	^{125}I	59.9 days	1.5×10^{-8}	10
Iodine-131	^{131}I	8.04 days	2.2×10^{-8}	6
Molybdenum-99	^{99}Mo	65.9 hours	1.9×10^{-9}	70
Strontium-90	^{90}Sr	29 years	2.8×10^{-8}	5
Tritium**	^{3}H	12.3 years	1.8×10^{-11}	7000

* The activity concentration of natural uranium corresponding to the chemical guideline of 0.02 mg/L is about 0.5 Bq/L.

** Tritium is also produced naturally in the atmosphere in significant quantities.

Appendix C

(cont'd.)

Table 6
Secondary List of Radionuclides – Maximum Acceptable Concentrations (MACs)

Radionuclide		Half-life $t_{1/2}$	DCF (Sv/Bq)	MAC (Bq/L)
Natural Radionuclides				
Beryllium-7	^{7}Be	53.3 days	3.3×10^{-11}	4000
Bismurb-210	^{210}Bi	5.01 days	2.1×10^{-9}	70
Polonium-210	^{210}Po	138.4 days	6.2×10^{-7}	0.2
*Artificial Radionuclides***				
Americium-241	^{241}Am	432 years	5.7×10^{-7}	0.2
Antimony-122	^{122}Sb	2.71 days	2.8×10^{-9}	50
Antimony-124	^{124}Sb	60.2 days	3.6×10^{-9}	40
Antimony-125	^{125}Sb	2.76 years	9.8×10^{-10}	100
Barium-140	^{140}Ba	12.8 days	3.7×10^{-9}	40
Bromine-82	^{82}Br	35.3 hours	4.8×10^{-10}	300
Calcium-45	^{45}Ca	165 days	8.9×10^{-10}	200
Calcium-47	^{47}Ca	4.54 days	2.2×10^{-9}	60
Carbon-14	^{14}C	5730 years	5.6×10^{-10}	200
Cerium-141	^{141}Ce	32.5 days	1.2×10^{-9}	100
Cerium-144	^{144}Ce	284.4 days	8.8×10^{-9}	20
Cesium-131	^{131}Cs	9.69 days	6.6×10^{-11}	2000
Cesium-136	^{136}Cs	13.1 days	3.0×10^{-9}	50
Chromium-51	^{51}Cr	27.7 days	5.3×10^{-11}	3000
Cobalt-57	^{57}Co	271.8 days	3.5×10^{-9}	40
Cobalt-58	^{58}Co	70.9 days	6.8×10^{-9}	20
Cobalt-60	^{60}Co	5.27 years	9.2×10^{-8}	2
Gallium-67	^{67}Ga	78.3 hours	2.6×10^{-10}	500
Gold-198	^{198}Au	2.69 days	1.6×10^{-9}	90
Indium-111	^{111}In	2.81 days	3.9×10^{-10}	400
Iodine-129	^{129}I	1.60×10^{7} years	1.1×10^{-7}	1
Iron-55	^{55}Fe	2.68 years	4.0×10^{-10}	300
Iron-59	^{59}Fe	44.5 days	3.1×10^{-9}	40
Manganese-54	^{54}Mn	312.2 days	7.3×10^{-10}	200
Mercury-197	^{197}Hg	64.1 hours	3.3×10^{-10}	400
Mercury-203	^{203}Hg	46.6 days	1.8×10^{-9}	80
Neptunium-239	^{239}Np	2.35 days	1.2×10^{-9}	100
Niobium-95	^{95}Nb	35.0 days	7.7×10^{-10}	200
Phosphorus-32	^{32}P	14.3 days	2.6×10^{-9}	50
Plutonium-238	^{238}Pu	87.7 years	5.1×10^{-7}	0.3
Plutonium-239	^{239}Pu	2.41×10^{4} years	5.6×10^{-7}	0.2
Plutonium-240	^{240}Pu	6560 years	5.6×10^{-7}	0.2
Plutonium-241	^{241}Pu	14.4 years	1.1×10^{-8}	10

* The activity concentration of natural uranium corresponding to the chemical guideline of 0.1 mg/L (see separate criteria summary on uranium in the Supporting Documentation) is about 2.6 Bq/L.

** Tritium and ^{14}C are also produced naturally in the atmosphere in significant quantities.

Appendix C

(cont'd.)

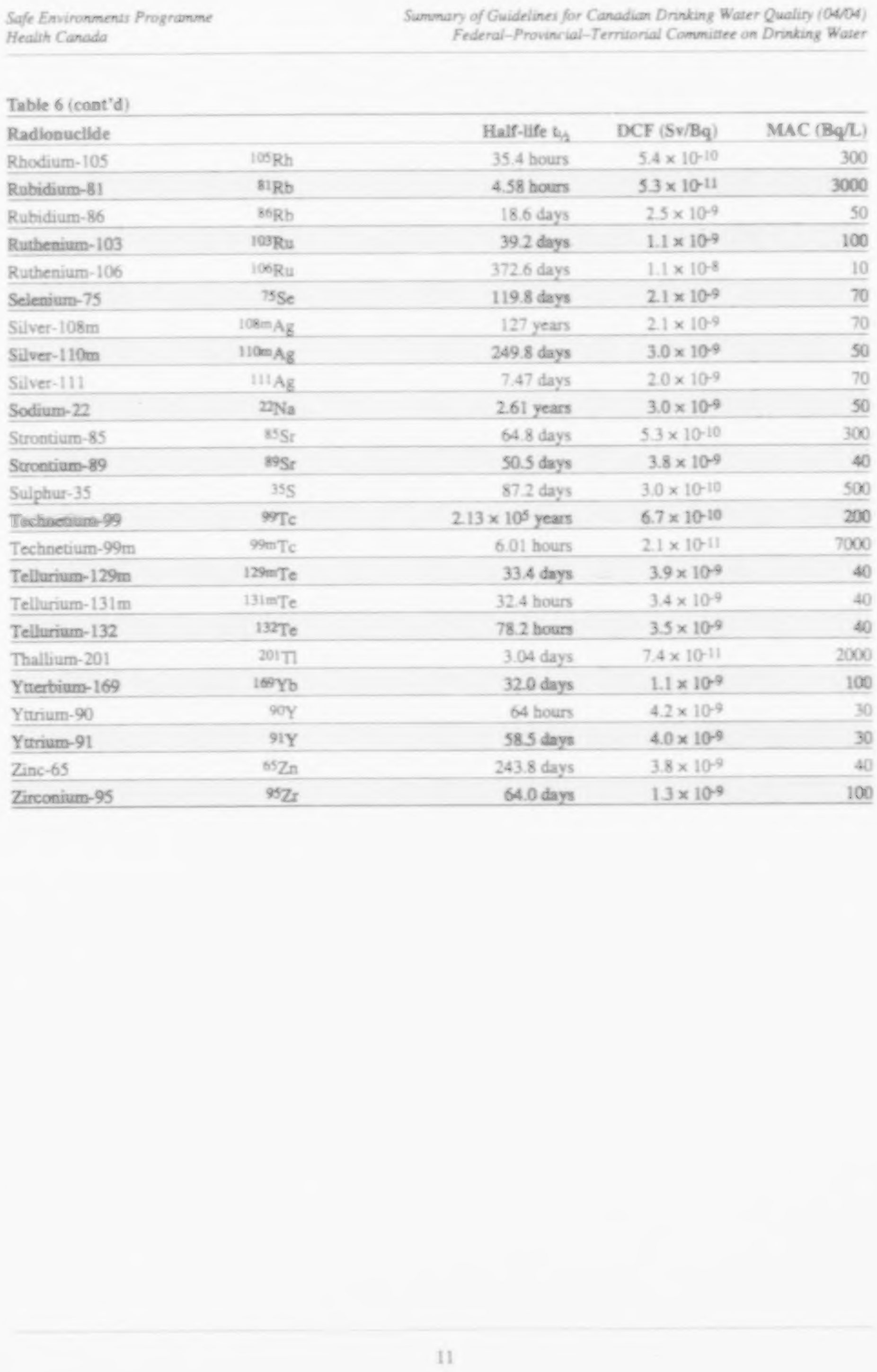


Table 6 (cont'd)

Radionuclide		Half-life $t_{1/2}$	DCF (Sv/Bq)	MAC (Bq/L)
Rhodium-105	^{105}Rh	35.4 hours	5.4×10^{-10}	300
Rubidium-81	^{81}Rb	4.58 hours	5.3×10^{-11}	3000
Rubidium-86	^{86}Rb	18.6 days	2.5×10^{-9}	50
Ruthenium-103	^{103}Ru	39.2 days	1.1×10^{-9}	100
Ruthenium-106	^{106}Ru	372.6 days	1.1×10^{-8}	10
Selenium-75	^{75}Se	119.8 days	2.1×10^{-9}	70
Silver-108m	^{108m}Ag	127 years	2.1×10^{-9}	70
Silver-110m	^{110m}Ag	249.8 days	3.0×10^{-9}	50
Silver-111	^{111}Ag	7.47 days	2.0×10^{-9}	70
Sodium-22	^{22}Na	2.61 years	3.0×10^{-9}	50
Strontium-85	^{85}Sr	64.8 days	5.3×10^{-10}	300
Strontium-89	^{89}Sr	50.5 days	3.8×10^{-9}	40
Sulphur-35	^{35}S	87.2 days	3.0×10^{-10}	500
Technetium-99	^{99}Tc	2.13×10^{5} years	6.7×10^{-10}	200
Technetium-99m	^{99m}Tc	6.01 hours	2.1×10^{-11}	7000
Tellurium-129m	^{129m}Te	33.4 days	3.9×10^{-9}	40
Tellurium-131m	^{131m}Te	32.4 hours	3.4×10^{-9}	40
Tellurium-132	^{132}Te	78.2 hours	3.5×10^{-9}	40
Thallium-201	^{201}Tl	3.04 days	7.4×10^{-11}	2000
Ytterbium-169	^{169}Yb	32.0 days	1.1×10^{-9}	100
Yttrium-90	^{90}Y	64 hours	4.2×10^{-9}	30
Yttrium-91	^{91}Y	58.5 days	4.0×10^{-9}	30
Zinc-65	^{65}Zn	243.8 days	3.8×10^{-9}	40
Zirconium-95	^{95}Zr	64.0 days	1.3×10^{-9}	100

Appendix D

MAIN WATER WELL GUIDES OR FACT SHEETS IN MANITOBA

Publication	Issued By/Date	Main Practice or Consideration
Well Water Fact Sheet, *How do I know if my well water is safe from bacterial contamination?* (Fact Sheet #1)	Office of the Chief Medical Officer of Health – March 2001	"To be safe for drinking, your well water's bacteriological, chemical, and physical parameters should meet the Guidelines for Canadian Drinking Water Quality." The fact sheet addresses the bacterial safety of drinking water.
Well Water Fact Sheet, *How do I test my well water for bacterial contamination?* (Fact Sheet #2)	Office of the Chief Medical Officer of Health – March 2001	"There are a number of accredited and non-accredited laboratories that are capable of carrying out bacteriological testing. It is recommended that the bacterial analysis of drinking water be carried out by an accredited laboratory." The fact sheet describes the process for collecting, submitting, interpreting the results and actions to be taken when results are positive (i.e., contamination detected).
Well Water Fact Sheet, *What do I do when a boil water advisory is issued?* (Fact Sheet #3)	Office of the Chief Medical Officer of Health – March 2001	"There are different reasons for issuing a boil water advisory, including bacteriological/microbial testing that suggests possible widespread aquifer or groundwater contamination within a community, or an outbreak of illness that may be due to consumption of the water within a community". The fact sheet describes various household situations for how the water may be used.
Well Water Fact Sheet, *How do I disinfect my well?* (Fact Sheet #4)	Office of the Chief Medical Officer of Health – March 2001	"While Manitoba has an abundance of good quality water, private wells can become contaminated with bacteria. The risk for contamination is increased by several factors". The fact sheet describes various risk factors and provides step-by-step instructions for full shock chlorination to disinfect a well.
Well Water Fact Sheet, *Guidelines for food establishments during a boil water advisory.* (Fact Sheet #5)	Office of the Chief Medical Officer of Health – March 2001	"Food establishments can continue to operate during the boil water advisory, as long as the measures outlined in the fact sheet are strictly adhered to". The fact sheet describes a series of measures that are to be followed.
Well Water Fact Sheet: *What water treatment devices are available?* (Fact Sheet #6)	Office of the Chief Medical Officer of Health – March 2001	The fact sheet describes various water treatment devices available.
Nitrate in drinking water	Manitoba Health – March 1993	A single page publication recommending testing of water for nitrates with testing done at W.M Ward Technical Services Laboratory.
Is Your Well Water Safe?	Office of the Chief Medical Officer of Health – undated, circa 2000	A two page publication recommending testing of water for bacterial contamination.
Guide for Sealing Abandoned Water Wells in Manitoba	Canada-Manitoba Agreement on Agricultural Sustainability – March 2002	A guideline describing procedures to properly fill and seal a well, as well as completing a blank Abandoned Well Report and providing it to the Water Branch of the Department of Conservation.
Nitrates in Soil and Water (Fact Sheet #4)	Manitoba Agriculture, Food and Rural Initiatives (Agriculture)-Spring 2000	One of the publications from the series *Living with Livestock Production.*
Livestock Operations & Groundwater Quality (Fact Sheet #9)	Agriculture – Fall 2001	One of the publications from the series *Living with Livestock Production.*
Bacteriological Contamination of Private Wells	Manitoba Water Services Board (MWSB) and Department of Conservation (Conservation) – undated	A publication focusing on the sampling of well water and testing by accredited laboratories. This publication is comparable to *Is Your Well Water Safe.*
Private Well Disinfection	MWSB and Conservation – undated	A publication focusing on two methods to disinfect a well and distribution system. This publication is comparable to *How do I disinfect my well?*
Water Facts, *Sealing Abandoned Wells*	Intergovernmental Affairs, MWSB – March 2000	A single page publication on sealing a well.
Water Facts, *Form Water Analysis*	Intergovernmental Affairs, MWSB – February 2001; also Agriculture, MWSB-October 1987	A publication discussing bacterial and chemical analysis of the water.
Water Facts, *Pitless Adapter for Submersible Pumps*	Agriculture, MWSB – November 1985	A publication discussing the benefits and installation of a pitless adapter and discouraging the use of well pits.

Appendix D
(cont'd.)

Publication	Issued By/Date	Main Practice or Consideration
Water Facts, *Shock Chlorination for Iron Bacterial Control*	Intergovernmental Affairs, MWSB – August 1999; also Agriculture, MWSB – October 1985	A publication discussing iron bacteria in wells and remediation procedures using shock chlorination.
Water Facts, *Large Diameter Screened Wells*	Agriculture, MWSB – November 1985	A publication discussing construction of large diameter wells.
Water Facts, *Single and Multi-stage Shallow Well Jet Pumps*	Agriculture, MWSB – November 1985	A publication discussing a certain type of well pump.
Water Fact, *Manganese Greensand Filters and Softeners*	Agriculture, MWSB – June 1985	A publication discussing iron filters and water softeners.
Water Facts, *Activated Carbon Filters*	Agriculture, MWSB – November 1985	A publication discussing carbon filters.
Water Facts, *Controlling Cistern Water Odors*	Agriculture, MWSB – September 1985	A publication discussing chlorination of water collected in a cistern storage device.

Appendix E | WHAT DO I DO WHEN A BOIL WATER ADVISORY IS ISSUED?

Well Water Fact Sheet

Manitoba Health

Office of the Chief Medical Officer of Health

March 2001

What do I do when a boil water advisory is issued?

What are the reasons for a boil water advisory?

There are different reasons for issuing a boil water advisory. These include:

- Bacteriological/microbial testing that suggests possible widespread aquifer or groundwater contamination within a community;
- An outbreak of illness that may be due to consumption of the water within a community;

HOW DO I USE WATER WHEN THE BOIL WATER ADVISORY HAS BEEN ISSUED FOR *DRINKING WATER ONLY*?

Where the boil advisory is for drinking water only, the water can be used for general domestic purposes, including handwashing, bathing and showering (providing the water is not swallowed), dishwashing and laundry.

Water used for drinking purposes should be brought to a rolling boil. This applies to water used for making infant formula and juices, cooking, making ice, washing fruits and vegetables, and brushing teeth. Discard all ice made before the boil water advisory was issued, and disinfect the ice cube trays. (*Caution: Place kettles and pots on back burners or away from counter edges to avoid spillage and scalding.*)

Alternate safe supplies of water, such as bottled water, can also be used.

Can I take a bath?

Adults and teens may shower or bath with untreated water as long as they can avoid swallowing water. Older children may take or be given a shower with a hand-held showerhead, avoiding the face. Younger children should be sponge-bathed instead of bathing in a tub because they are likely to swallow tub or shower water.

HOW DO I USE WATER WHEN THE BOIL WATER ADVISORY HAS BEEN ISSUED FOR *ALL DOMESTIC PURPOSES*?

Can I use the water for drinking purposes?

All types of boil water advisories include drinking water. The water cannot be used for drinking until it is properly sterilized by bringing it to a rolling boil. This includes water used for infant formula and juice, cooking, making ice, washing fruits and vegetables, and brushing teeth.

Can I use the water for handwashing?

Water can be used for handwashing after the following water treatment: Use one part regular household bleach to 1,000 parts water. Mix and let stand for at least 10 minutes prior to use. (Use 5 ml or 1 teaspoon of bleach in 5 litres or 1 gallon of water.)

How else can I disinfect my hands?

You can use alcohol-based hand disinfectants, containing more than 60% alcohol. These products are widely used in health-care settings for washing hands, or in situations when water is not available. The wet wipes used for cleaning babies during a diaper change are not effective for disinfecting hands and should not be used for this purpose.

Appendix E
(cont'd.)

Can I take a bath or shower?

Bathing or showering in this water is not recommended.

Is it safe to use my dishwasher?

If your dishwasher has a hot setting, it safely disinfects dishes. If your dishwasher does not have a hot setting, wait until the washing cycle is complete. Then soak dishes for one minute in a 1:1000 solution of regular household bleach. (5 ml or 1 tsp of bleach in 5 litres or 1 gallon of water).

If I wash dishes by hand, how do I disinfect them?

You could use boiled water for washing dishes. Dishes washed in soap and hot water can also be rinsed in boiled water, or disinfected by soaking dishes for one minute with the 1:1000 bleach solution: (5 ml or 1 tsp of bleach in 5 litres or 1 gallon of water). Let dishes air dry.

How do I disinfect countertops, chopping boards or utensils?

Countertops, chopping boards or utensils should be washed with soap and hot water first, then disinfected with the following bleach solution: one part bleach with 75 parts water (15 ml or 3 teaspoons of regular bleach in one litre of water). Do not reuse or store this solution. Make it fresh daily.

Should I change the way I am doing laundry?

No, continue doing laundry the way you usually do, but wash your hands as described above when finished.

Is the water safe to fill wading pools for children?

No, the water is not safe to use in wading pools. Water usually gets into the mouths of small children, and is therefore a possible source of infection.

Does an installed water treatment device make the water safe?

It may not, because of the variable nature of the water source and the large variety,of treatment devices available. Water used for drinking purposes should be brought to a rolling boil before it is used. This applies to water used for infant formula and juices, cooking, making ice, washing fruits and vegetables, and brushing teeth.

What should I do after the boil water advisory is lifted?

Purge your entire system. Shut off power, drain and refill hot water heaters. Run water softeners through a regeneration cycle. Run cold water faucets for five minutes before using the water. Run drinking fountains for five minutes before using the water. Flush all garden hoses by running cold water through them for five minutes. Remove and clean all screens on taps.

My doctor told me I am immunocompromised - what should I do?

Contact your physician and follow his or her advice.

Appendix E

(cont'd.)

Drinking Water Fact Sheets

- How Do I Know If My Well Water Is Safe from bacterial contamination?
- How Do I Test My Well Water for bacterial contamination?
- What Do I Do When a Boil Water Advisory is Issued?
- How Do I Disinfect My Well?
- Guidelines for Food Establishments During a Boil Water Advisory

Where can I get more information?

For further information on well water safety, please contact the nearest office of Manitoba Conservation or The Manitoba Water Services Board at the numbers listed on this fact sheet, or call Health Links at 788-8200 or toll-free 1-888-315-9257.

Manitoba Conservation

Winnipeg	204-945-0675
Fax	204-945-1211
Brandon	204-726-6064
Fax	204-726-6567
Virden	204-748-2321
Fax	204-748-2388
Steinbach	204-346-6060
Fax	204-326-2472
Selkirk	204-785-5030
Fax	204-785-5024
Lac du Bonnet	204-345-1447
Fax	204-345-1415
Flin Flon	204-687-1625
Fax	204-687-1623
The Pas	204-627-8307
Fax	204-623-1773
Killarney	204-523-5285
Fax	204-523-4626
Dauphin	204-622-2030
Fax	204-622-2306
Swan River	204-734-3436
Fax	204-734-5151
Winkler	204-325-1750
Fax	204-325-1758
Portage la Prairie	204-239-3188
Fax	204-239-3185
Thompson	204-677-6704
Fax	204-677-6652

The Manitoba Water Services Board

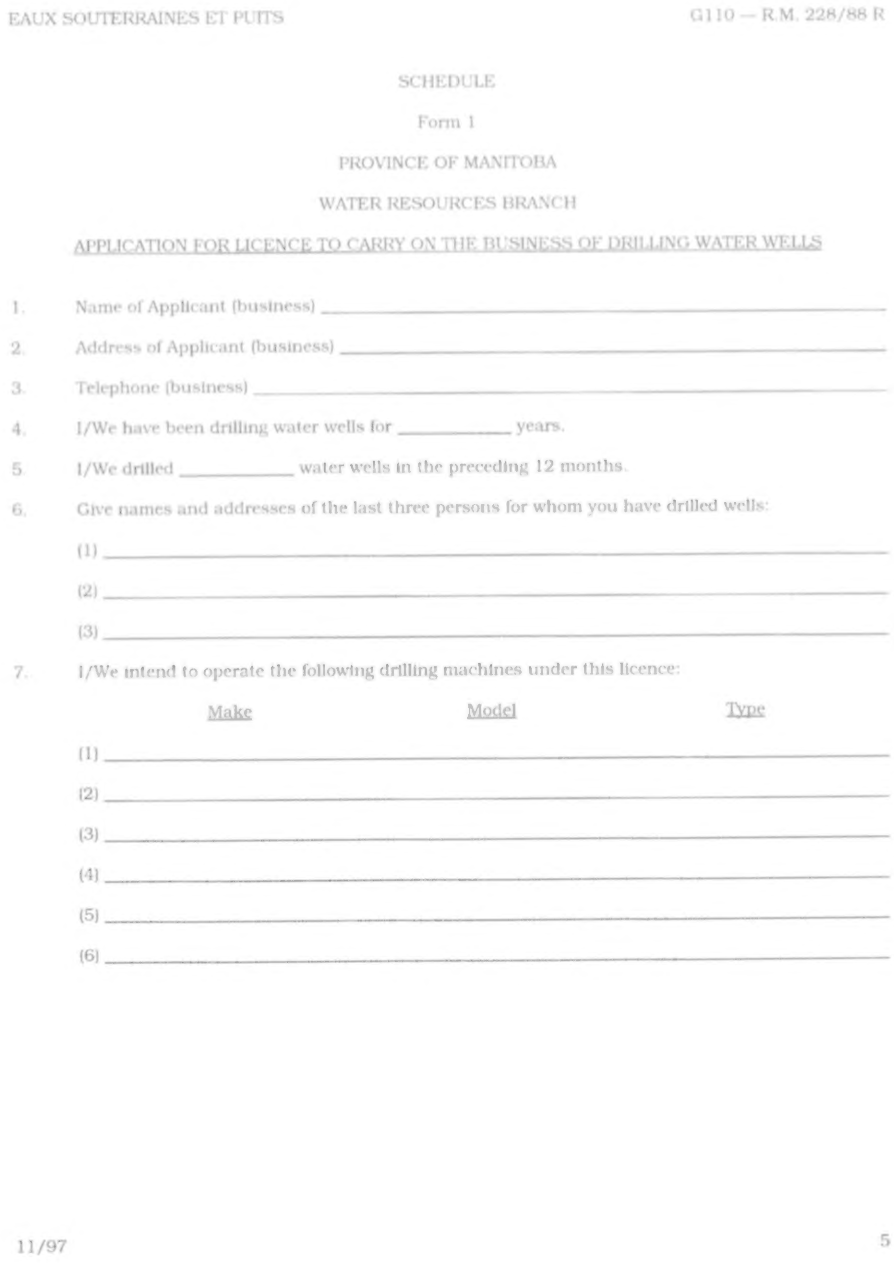
Brandon	204-726-6079
Fax	204-726-6290
Dauphin	204-622-2116
Fax	204-622-2298
Beausejour	204-268-6059
Fax	204-268-6060

Office of the Chief Medical Officer of Health
4th Floor, 300 Carlton Street
Winnipeg, MB R3B 3M9
Ph: (204) 788-6666
Fax: (204) 948-2204

Information Compiled by the Drinking Water Coordinating Group

APPLICATION FOR LICENCE TO CARRY ON THE BUSINESS OF DRILLING WATER WELLS

Appendix F



EAUX SOUTERRAINES ET PUITS G110 — R.M. 228/88 R

SCHEDULE

Form 1

PROVINCE OF MANITOBA

WATER RESOURCES BRANCH

APPLICATION FOR LICENCE TO CARRY ON THE BUSINESS OF DRILLING WATER WELLS

1. Name of Applicant (business) ______________________
2. Address of Applicant (business) ______________________
3. Telephone (business) ______________________
4. I/We have been drilling water wells for __________ years.
5. I/We drilled __________ water wells in the preceding 12 months.
6. Give names and addresses of the last three persons for whom you have drilled wells:

   (1) ______________________

   (2) ______________________

   (3) ______________________

7. I/We intend to operate the following drilling machines under this licence:

   Make Model Type

   (1) ______________________

   (2) ______________________

   (3) ______________________

   (4) ______________________

   (5) ______________________

   (6) ______________________

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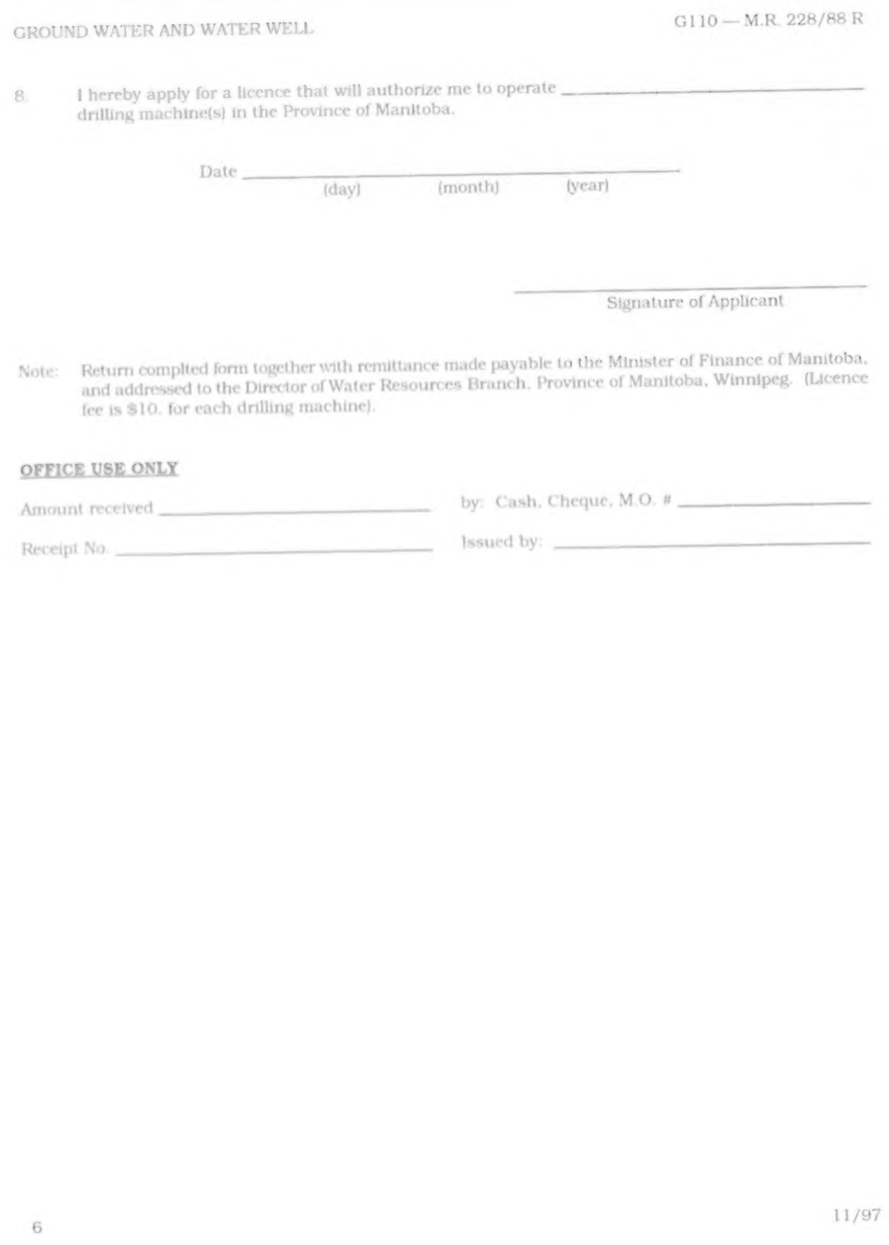
Appendix F
(cont'd.)



GROUND WATER AND WATER WELL

G110 — M.R. 228/88 R

8. I hereby apply for a licence that will authorize me to operate ______________ drilling machine(s) in the Province of Manitoba.

Date ______________________
(day) (month) (year)

____
Signature of Applicant

Note: Return complted form together with remittance made payable to the Minister of Finance of Manitoba, and addressed to the Director of Water Resources Branch, Province of Manitoba, Winnipeg. (Licence fee is $10. for each drilling machine).

OFFICE USE ONLY

Amount received ______________ by: Cash, Cheque, M.O. # ______________

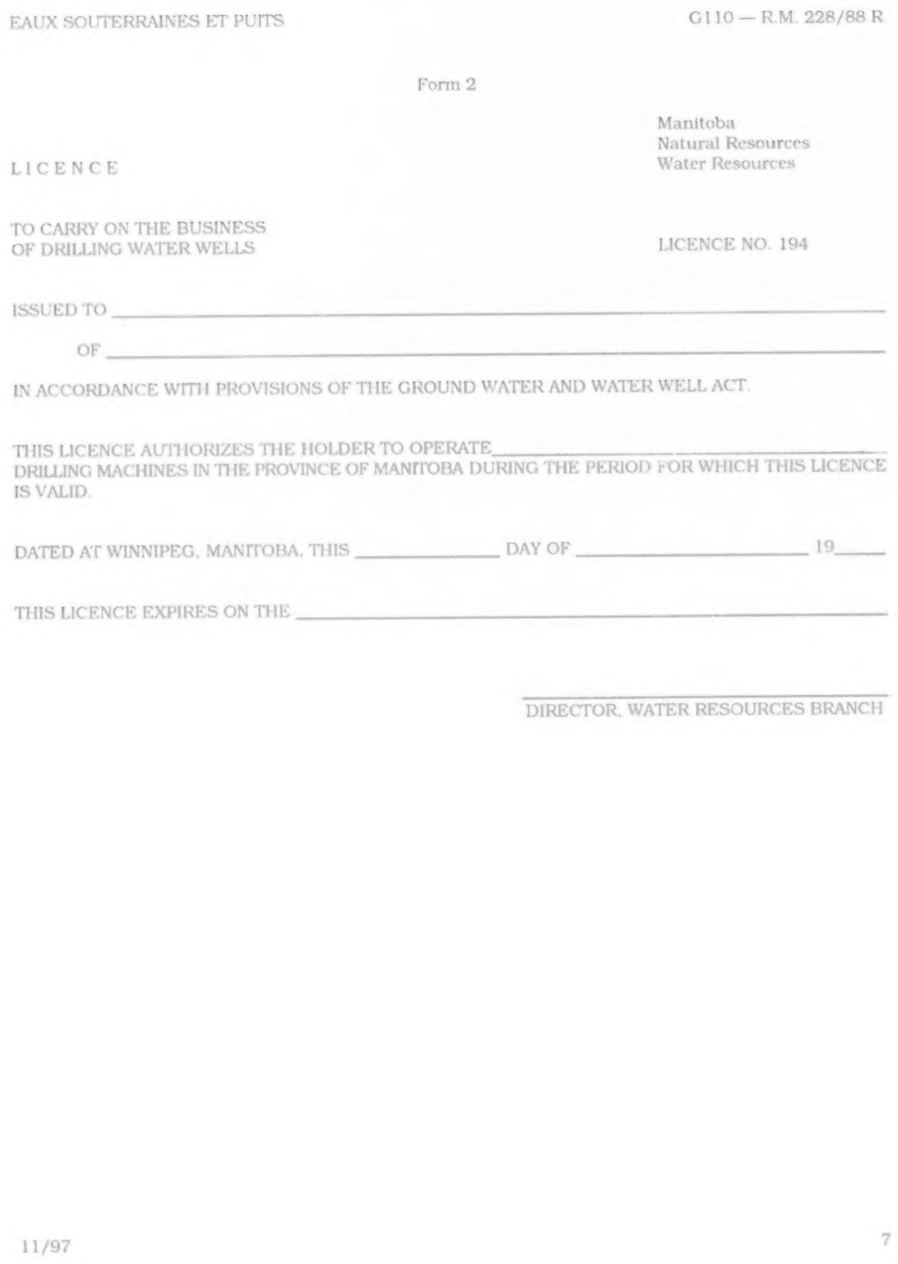
Receipt No. ______________ Issued by: ______________

6

11/97

LICENCE TO CARRY ON THE BUSINESS OF DRILLING WATER WELLS

Appendix G



EAUX SOUTERRAINES ET PUITS

G110 — R.M. 228/88 R

Form 2

Manitoba
Natural Resources
Water Resources

LICENCE

TO CARRY ON THE BUSINESS
OF DRILLING WATER WELLS

LICENCE NO. 194

ISSUED TO ____________________

OF ____________________

IN ACCORDANCE WITH PROVISIONS OF THE GROUND WATER AND WATER WELL ACT.

THIS LICENCE AUTHORIZES THE HOLDER TO OPERATE ____________ DRILLING MACHINES IN THE PROVINCE OF MANITOBA DURING THE PERIOD FOR WHICH THIS LICENCE IS VALID.

DATED AT WINNIPEG, MANITOBA, THIS ________ DAY OF ____________ 19____

THIS LICENCE EXPIRES ON THE ____________________

____
DIRECTOR, WATER RESOURCES BRANCH

11/97

7

Appendix G
(cont'd.)

Form 3

PROVINCE OF MANITOBA
WATER RESOURCES BRANCH

THE OPERATION OF THIS MACHINE TO DRILL

WATER WELLS

IN MANITOBA IS AUTHORIZED UNDER

LICENCE NO.

Plate Form and Yearly
Validation Strip

EXTRACTS FROM LEGISLATION CONCERNING WATER WELLS THAT STATE DESIRED OUTCOMES

Appendix H

Act	Regulation	Responsible Department	Extract
Ground Water and Water Well Act (Chapter – G110)		Water Stewardship	10(1) *" No person shall drill a well without taking reasonable precautions to avoid polluting, or contaminating, or diminishing the purity of, groundwater in the area"*
Ground Water and Water Well Act	Well Drilling Regulation (228/1988R) and (123/1989)	Water Stewardship	7 *"Within five days of completion of the drilling of a well, the well driller shall make a report in form 4* [Driller's Report] *and send it by mail or deliver it to the Director"* 11 *"In drilling a well, the well driller shall install a previously unused casing"* 12 *"In completing a well installation, which includes constructing a well pit, installing a pumping system, and making underground connections to the well, the well driller shall take adequate precautions to prevent surface water from entering the well"* 13 *"Where* *(a) any water that might impair the usefulness of the well; or* *(b) any other liquid or soluble substance that might affect the quality of the groundwater is produced from the well,* *is encountered in drilling a well, the well driller shall construct the well in such a manner that the water or liquid or soluble substance cannot enter the well"* 14 *"Where a well driller has been notified that artesian conditions may exist at the site of a proposed well, he shall take adequate precautions to ensure that the well casing is firmly sealed in the impermeable formation above the artesian aquifer"* 15 *"Where a well is dry or abandoned, the owner shall fill and seal it in a manner sufficient to prevent the vertical movement of water in it"*
Public Health Act (Chapter – P210)	Water Supplies Regulation (330/1988R)	Health	6(1) *"Wells constructed for domestic purposes shall be located, constructed and maintained as to prevent contamination of the water"* 6(2) *"The medical officer of health or inspector may direct the methods of construction or the materials, or both the methods and materials, that may be used to protect a water supply"* 6(3) *"Where a well is no longer in use or is permanently abandoned, the owner thereof shall protect the water bearing formation against possible pollution as directed by the medical officer of health"*
Public Health Act	Protection of Water Sources Regulation (326/1988R)	Health	2(2) *"No person shall commit any act that will or may contaminate any underground water supply by the discharge of any sewage, surface drainage, liquid waste, or filth into any well, abandoned well, hole, or other opening, and no person shall fill or replenish any existing well, except with water from an approved source satisfactory to the medical officer of health"*
Environment Act (Chapter – P210)	Rockwood Sensitive Area Regulation (121/1994)	Conservation	3 *"No person shall drill or modify a well or permit the drilling or modification of a well within the Rockwood Sensitive Area, except under the authority of a permit issued by the director"* 4 *"An application for a permit to drill or modify a well within the Rockwood Sensitive Area shall be made in writing to the director, on a form acceptable to the director and containing the following information:"* 8(1) *"No person shall cause or allow a well within the Rockwood Sensitive Area to be in a state of disrepair"* 8(2) *"No person shall abandon a well within the Rockwood Sensitive Area, except under the authority of a permit issued under Section 10"*

Appendix I

EXTRACTS FROM REGULATIONS THAT STATE SEPARATION DISTANCES

Act	Regulation	Responsible Department	Extract
Environment Act	Livestock Manure and Mortalities Management Regulation (42/1998)	Conservation	5,6 *"The construction, modification or expansion of a manure storage facility shall meet the minimum setback requirement of (b) 100m from any well"* 7(2) *"A person who stores solid livestock manure as field storage shall (a) locate the livestock manure at least 100m from any surface watercourse, sinkhole, spring or well;"* 8 *"No person shall compost livestock manure or mortalities on the property of an agricultural operation unless the composting site is located 100m from a well"*
Environment Act	Onsite Wastewater Management Systems Regulation (83/2003)	Conservation	8(3),(4) and Schedules A and B *"Septic tanks and aerobic treatment units... shall... be set back at least the distance indicated below...* *(iii) well...8m (26feet)* *Disposal fields ...* *(vii) well (drilled and cased to a minimum of 6m (20 feet) below ground level)..................................15m (50 feet)* *(viii) other wells and springs.....................30m (100 feet)"* 14 and Schedule E *"Sewage ejector systems...* *Wastewater effluent discharged...no closer than...* *(v) a well...60m (200 feet)"* 17 *"Pit privies...no person shall have, install, use...* *(b) closer that 15m (50 feet) to a drilled water well equipped with a casing to a depth of not less than 6m (20 feet) below ground level;* *(c) closer than 30m (100 feet) to a spring or water well other than a water well described in clause (b)"* 18 *"Vault and pail privies... no person shall have, install, use...that is closer than* *(c) 8m (26 feet) to a well"* 23 and Schedule C *"Septage... is applied to the land...no closer than...* *(v) a well...60m (200 feet)"*
Environment Act	Waste Disposal Grounds Regulation (159/1991)	Conservation	8 *"An operator of a waste disposal ground shall ensure that the waste disposal ground is located at least 400m from any potable water well"*

COMPARISON OF CERTAIN ALBERTA WATER WELL CONSTRUCTION STANDARDS TO MANITOBA STANDARDS

Appendix J

<table>
<tr><th>Key Areas</th><th>Alberta (Regulation 205/98)</th><th>Manitoba</th></tr>
<tr><td>Water Well Site Specifications</td><td>The Regulation states:
"Driller and the owner of a water well must locate the water well site so that:
(a) the water well is accessible for cleaning, treatment, repair, testing, maintenance and inspection,
(b) the area immediate surrounding the water well may be kept in a sanitary condition,
(c) surface water does not collect or pond in the vicinity of the water well, and
(d) the water well is at least 3.25 metres away from the nearest building.

No person shall locate a water well in a pit.

No person shall locate a water well in a building other that a pumphouse that houses only the water well and the pump".</td><td>"Wells constructed for domestic purposes shall be located, constructed, and maintained as to prevent contamination of the water." (Ground Water and Water Well Act)

"In completing a well installation , which includes constructing a well pit, installing a pumping system, and making underground connections to the well, the well driller shall take adequate precautions to prevent surface water from entering the well". (Well Drilling Regulation)</td></tr>
<tr><td>Distance from sources of contamination</td><td>The Regulation states:
"No persons shall locate or drill a water well for the diversion of groundwater closer to a thing described in Table 1"
Table 1
<table>
<tr><th>Sources of Substances</th><th>Minimum Distance Required (metres)</th></tr>
<tr><td>Watertight septic tank or sewage holding tanks</td><td>10</td></tr>
<tr><td>Sub-surface weeping tile effluent disposal field or evaporation mound</td><td>15</td></tr>
<tr><td>Sewage effluent discharged to the ground surface</td><td>50</td></tr>
<tr><td>Sewage lagoon</td><td>100</td></tr>
<tr><td>Above ground storage tanks containing petroleum substances</td><td>50</td></tr>
</table></td><td>No well construction distance requirements from the well site to contamination sources.

Construction distance requirements are specified from the source of the contamination to the well. (Livestock Manure and Mortalities Management Regulation and Onsite Wastewater Management Systems Regulation)</td></tr>
<tr><td>Specifications for materials</td><td>The Regulation states:
"No person shall use or permit the use of materials in the drilling, construction, maintenance, servicing, or monitoring of a water well unless the materials
(a) are new and uncontaminated, and
(b) meet or exceed the specifications set out for that material and purpose by the Canadian Standards Association or the American Society for Testing and Materials".</td><td>"In drilling a well, the well driller shall install a previously unused casing." (Well Drilling Regulation)</td></tr>
<tr><td>Construction requirements (example -casing height</td><td>The Regulation states:
"The driller of a water well must ensure that the water well meets the following requirements:
(c) the water well must be constructed so that the casing extends
(i) not less than 20 centimetres above the pumphouse floor or the established ground surface, and
(ii) at least 60 centimetres above the highest flood record in the area, if the water well is not to be equipped with a watertight cap"</td><td>No standard.</td></tr>
<tr><td>Annulus</td><td>The Regulation describes the methods and specifications and are dependent on the different methods of constructing the well. Regardless of the method the regulation states:
"The annulus must be filled with a suitable cement, grout, concrete, bentonite or equivalent commercial slurry, or with clay slurry, impervious water well cuttings or impervious overburden materials".</td><td>No standard.</td></tr>
<tr><td>Disinfection of water well and pumping</td><td>The Regulation states:
"When a water well, other than a flowing well, has been drilled, developed, and yield tested, the driller must
(a) disinfect the water well so that a concentration of 200 milligrams of chlorine per litre of water is present throughout the water in the water well, and
(b) maintain the concentration prescribed in clause (a) in the water well for a period of at least 12 hours."
Also, the Regulation requires that the same process be followed by the person who installs the pumping equipment after the equipment has been installed.</td><td>No standard.</td></tr>
</table>

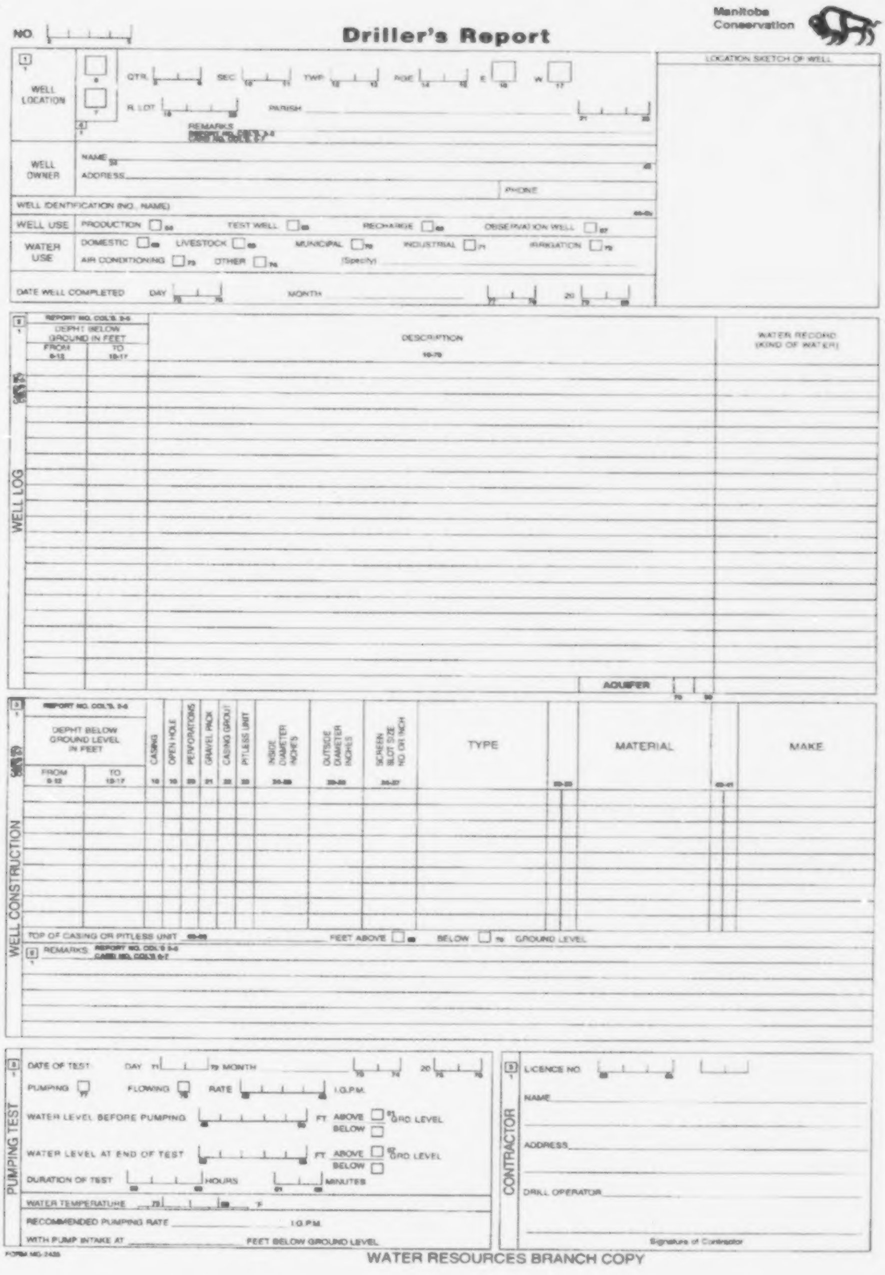
Appendix J

(cont'd.)

Key Areas	Alberta (Regulation 205/98)	Manitoba
Potential flowing water well	The Regulation states: "If a water well being drilled has the potential of flowing, the driller must ensure that the water well is drilled in a manner that prevents the water from flowing out of control".	"Where a well driller has been notified that artesian conditions may exist at the site of a proposed well, he shall take adequate precautions to ensure the well casing is firmly sealed in the impermeable formation above the artesian aquifer." (Well Drilling Regulation) The Ground Water and Water Well Act also contains provisions for the Minister responsible to direct the owner to control the flow or for other actions to occur should the owner not comply with the direction.
Completed flowing water well	The Regulation states: "On completion of a flowing water well, the driller must ensure that the water well is equipped with a variable flow control device to control the flow of water from the water well. After installation of the variable flow control device, the driller must (a) stop the flow of water for a period of not less that 48 hours by closing the control device, and (b) ensure that the water well is effectively sealed to prevent the escape of water from the annulus of the water well or its immediate vicinity".	No standard.
Well Abandonment	A prescribed method for sealing or abandoning is in the Regulation.	"Where a well is dry or abandoned, the owner shall fill and seal it in a manner sufficient to prevent the vertical movement of water in it." (Well Drilling Regulation) "Where a well is no longer in use or is permanently abandoned, the owner thereof shall protect the water bearing formation against possible contamination as directed by the medical officer of health." (Water Supplies Regulation)

DRILLER'S REPORT USED IN MANITOBA

Appendix K



Manitoba Conservation

NO.

Driller's Report

WELL LOCATION	QTR. ___ SEC ___ TWP ___ RGE ___ E ☐ W ☐ R. LOT ___ PARISH ___ REMARKS
WELL OWNER	NAME ___ ADDRESS ___ PHONE ___
WELL IDENTIFICATION (NO., NAME)	
WELL USE	PRODUCTION ☐ TEST WELL ☐ RECHARGE ☐ OBSERVATION WELL ☐
WATER USE	DOMESTIC ☐ LIVESTOCK ☐ MUNICIPAL ☐ INDUSTRIAL ☐ IRRIGATION ☐ AIR CONDITIONING ☐ OTHER ☐ (Specify) ___
DATE WELL COMPLETED	DAY ___ MONTH ___ 20 ___

LOCATION SKETCH OF WELL

WELL LOG

DEPTH BELOW GROUND IN FEET FROM 8-12	DEPTH BELOW GROUND IN FEET TO 13-17	DESCRIPTION	WATER RECORD (KIND OF WATER)
		AQUIFER	

WELL CONSTRUCTION

DEPTH BELOW GROUND LEVEL IN FEET FROM 8-12	DEPTH BELOW GROUND LEVEL IN FEET TO 13-17	CASING	OPEN HOLE	PERFORATIONS	GRAVEL PACK	CASING GROUT	PITLESS UNIT	INSIDE DIAMETER INCHES	OUTSIDE DIAMETER INCHES	SCREEN SLOT SIZE NO OR INCH	TYPE		MATERIAL		MAKE

TOP OF CASING OR PITLESS UNIT ___ FEET ABOVE ☐ BELOW ☐ GROUND LEVEL

REMARKS ___

PUMPING TEST

DATE OF TEST DAY ___ MONTH ___ 20 ___

PUMPING ☐ FLOWING ☐ RATE ___ I.G.P.M.

WATER LEVEL BEFORE PUMPING ___ FT ABOVE ☐ BELOW ☐ GRD LEVEL

WATER LEVEL AT END OF TEST ___ FT ABOVE ☐ BELOW ☐ GRD LEVEL

DURATION OF TEST ___ HOURS ___ MINUTES

WATER TEMPERATURE ___ °F

RECOMMENDED PUMPING RATE ___ I.G.P.M.

WITH PUMP INTAKE AT ___ FEET BELOW GROUND LEVEL

CONTRACTOR

LICENCE NO. ___

NAME ___

ADDRESS ___

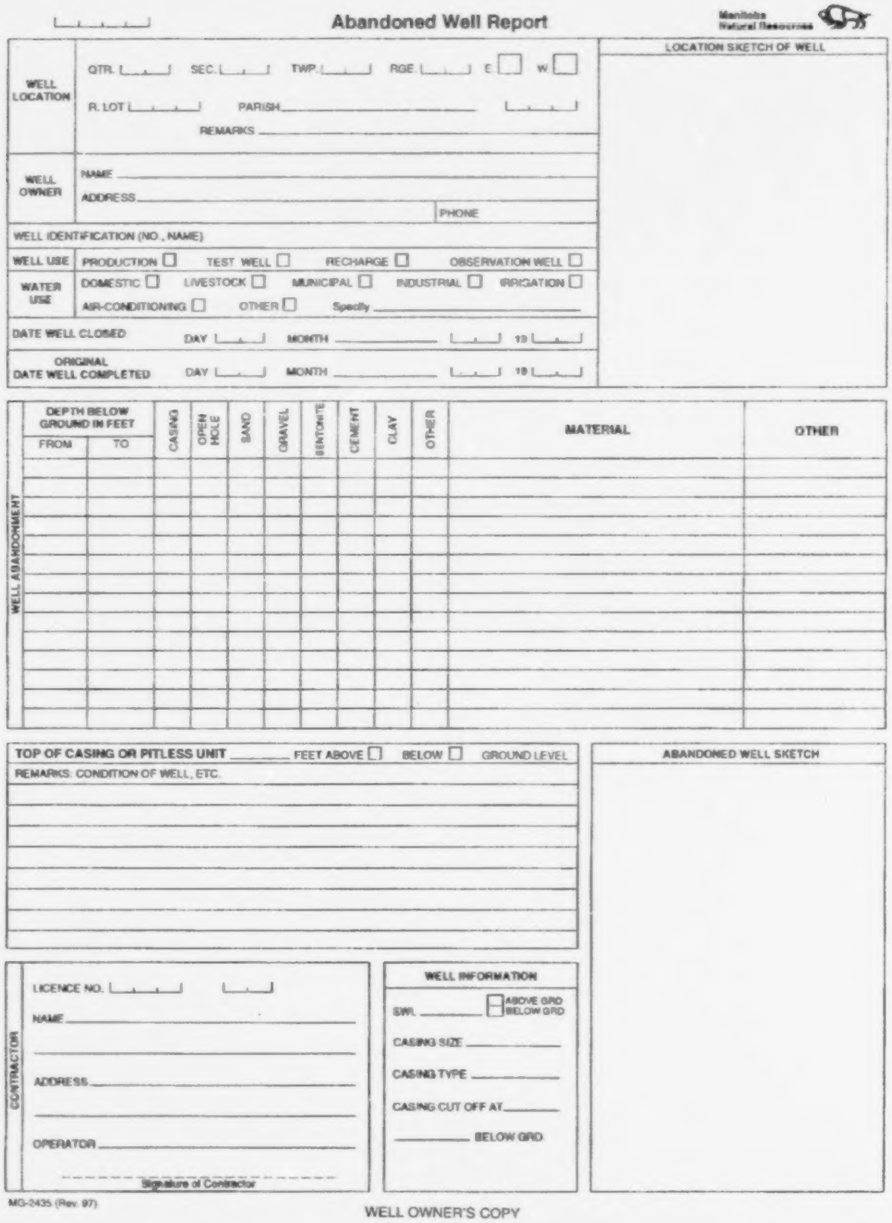
DRILL OPERATOR ___

Signature of Contractor

FORM MG-2435

WATER RESOURCES BRANCH COPY

Appendix L | ABANDONED WELL REPORT USED IN MANITOBA



Manitoba Natural Resources

Abandoned Well Report

LOCATION SKETCH OF WELL

WELL LOCATION
QTR. SEC. TWP. RGE. E ☐ W ☐
R. LOT PARISH
REMARKS

WELL OWNER
NAME
ADDRESS
PHONE

WELL IDENTIFICATION (NO., NAME)

WELL USE PRODUCTION ☐ TEST WELL ☐ RECHARGE ☐ OBSERVATION WELL ☐

WATER USE DOMESTIC ☐ LIVESTOCK ☐ MUNICIPAL ☐ INDUSTRIAL ☐ IRRIGATION ☐
AIR-CONDITIONING ☐ OTHER ☐ Specify

DATE WELL CLOSED DAY MONTH 19

ORIGINAL DATE WELL COMPLETED DAY MONTH 19

	DEPTH BELOW GROUND IN FEET		CASING	OPEN HOLE	SAND	GRAVEL	BENTONITE	CEMENT	CLAY	OTHER	MATERIAL	OTHER
	FROM	TO										
WELL ABANDONMENT												

TOP OF CASING OR PITLESS UNIT ______ FEET ABOVE ☐ BELOW ☐ GROUND LEVEL

REMARKS: CONDITION OF WELL, ETC.

ABANDONED WELL SKETCH

CONTRACTOR
LICENCE NO.
NAME
ADDRESS
OPERATOR
Signature of Contractor

WELL INFORMATION
SWL ______ ☐ ABOVE GRD ☐ BELOW GRD
CASING SIZE
CASING TYPE
CASING CUT OFF AT
______ BELOW GRD

MG-2435 (Rev. 97)

WELL OWNER'S COPY

Excerpt: The Auditor General Act

Audit of operations

14(1) In carrying out his or her responsibilities under this Act, the Auditor General may examine and audit the operations of a government organization with regard to any of the following matters:

(a) whether financial and administrative provisions of Acts, regulations, policies and directives have been complied with;

(b) whether public money has been expended with proper regard for economy and efficiency;

(c) whether public money has been provided with appropriate accountability information;

(d) whether the form and content of financial information documents is adequate and suitable.

Copies of this report may be obtained by contacting:

Office of the Auditor General

500–330 PORTAGE AVENUE

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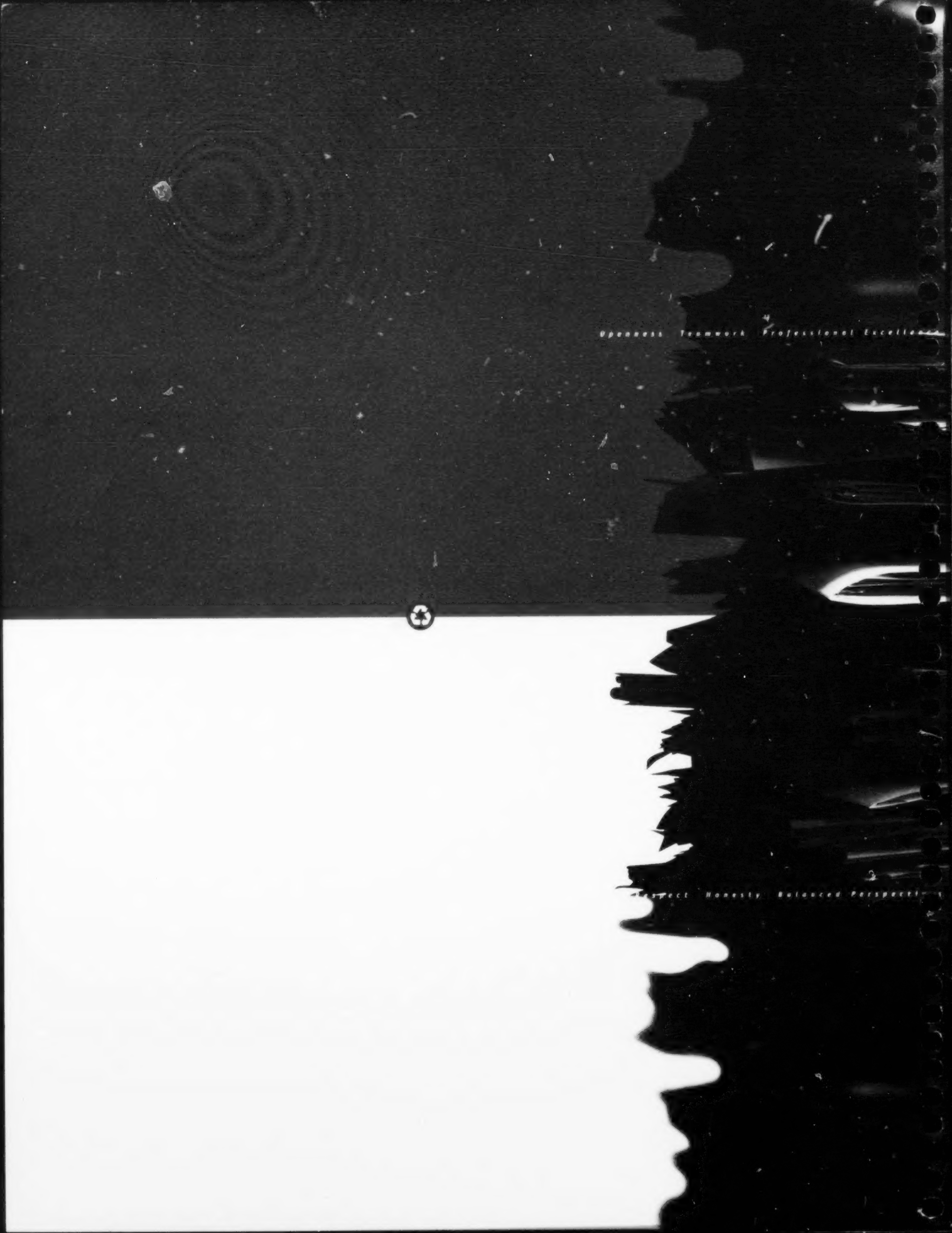

Openness Teamwork Professional Excelle

Respect Honesty Balanced Perspecti